AVIATION WEEK

SEPT. 11, 1950

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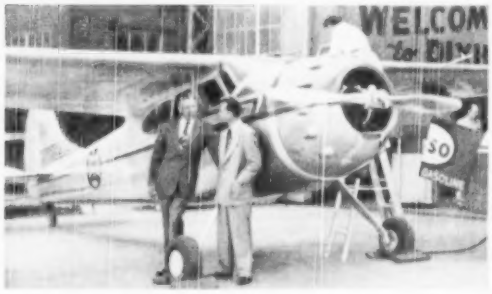

SERVICING BUSINESS PLANES is an important part of Dixie's operation. Here Manager Dal Miller, (right) discusses maintenance with A. W. Frederick, Marchant Calculator Distributor, Memphis.

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B.F.Goodrich

How to shut up a torrent of hot air

THE AIR DUCT in the photo above carries 90,000 cu. ft. of air an hour heated as high as 250°F. It's used to keep the cabin warm in the C-124 Globemaster II, huge cargo and troop carrier built by the Long Beach Plant of Douglas Aircraft.

The duct designers wanted to make it in six-foot sections of semi-flexible coated material to withstand damage from tanks, trucks and other heavy equipment carried by the C-124. But they had a puzzler on their hands in finding a coupling for the sections. It had to be flexible, strong, heat-resistant and permit easy removal of sections.

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B. F. Goodrich Pressure Sealing Zippers are doing a successful job too, in airplane doors, inverter covers, water-tight protective coverings and control surface seals. They are adaptable to any kind of covering, irregular shapes, and light or heavy requirements.

For help with your coupling problems, contact the Pressure Sealing Zipper engineers at *The B. F. Goodrich Co., International Division, Akron, Ohio.*

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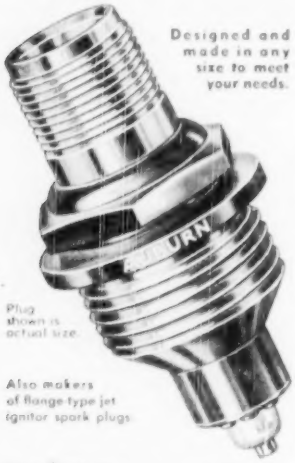

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Let us figure on your particular needs.

Five years of specializing in turbo-jet, jet prop and rocket spark plugs and ignition parts. Makers of

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CONVAIR

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Consolidated Vultee has its share of "firsts" in design and performance of Convair commercial and military planes. The performance records piled up by Convair ships call for unquestioned performance by ball bearings. Over nineteen years ago Fafnir Aircraft Ball Bearings became components of the forerunners of today's Convair planes. This long standing relationship has as its foundation something more than just good ball bearings. It results from a Fafnir attitude and aptitude — a way of looking at ball bearings from the designer's side, an aptitude gained from more than twenty years' specialization in aircraft ball bearings. The Fafnir Bearing Company, New Britain, Conn.

Fafnir Plya-Seal Ball Bearing, one of the Fafnir Ball Bearings specified for Convair planes, keeps grease in, contaminants out. It fully meets Air Force and Navy Anti-Friction Control Bearing Specifications.

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Macwhyte's "Hi-Fatigue" Aircraft Cable is available in reel lots, specified lengths or assemblies. It has uniform, minimum stretch throughout the reel which provides efficiency and economy in making assemblies, resulting in maximum service.

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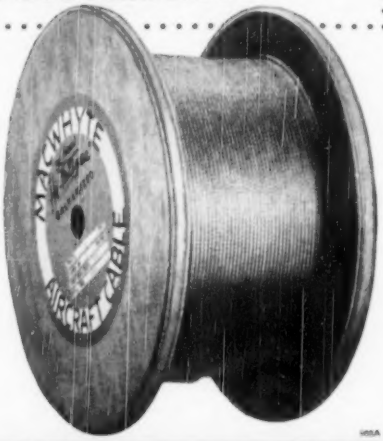
Call a Macwhyte distributor or send inquiries direct to Macwhyte Company. Catalog A-1 is available on request.



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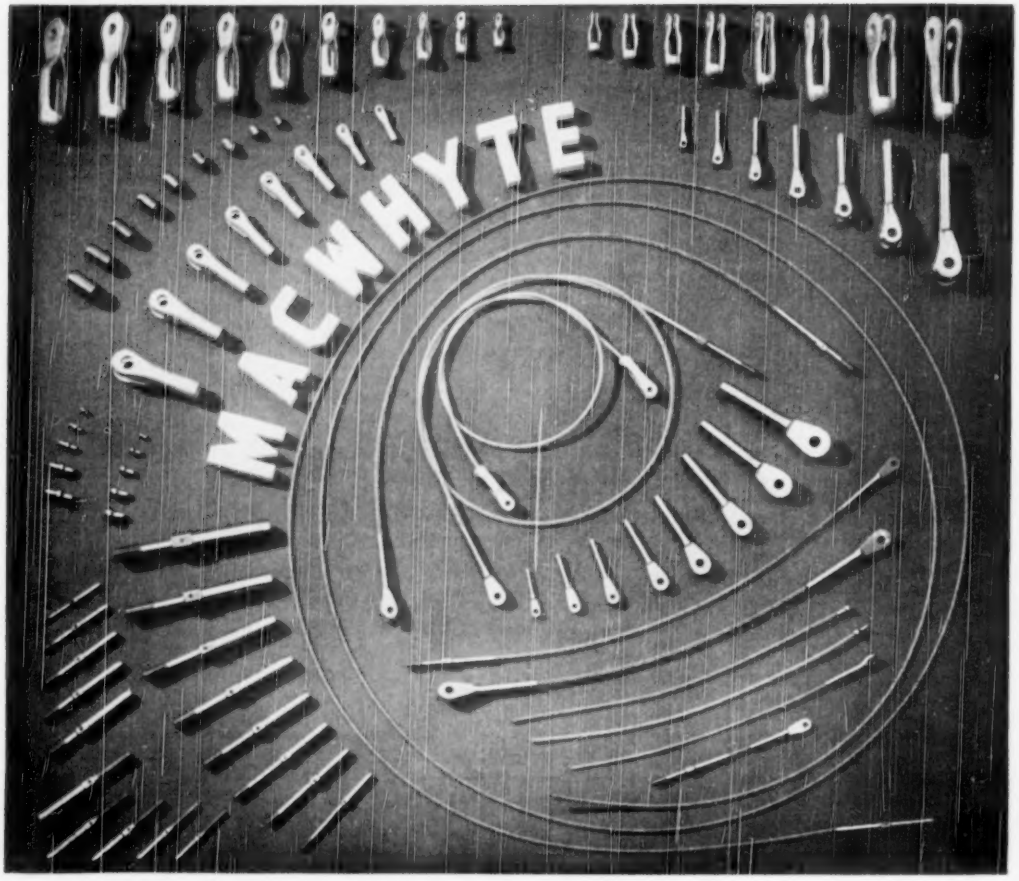


WHO'S WHERE

In the Front Office

General Electric Co. has named **Robert Paxton** manager of manufacturing policy, succeeding **Raymond R. Ramsch**, a vice president, who has resigned to return to the automotive industry. Paxton has been manager of the transformer and allied product divisions of the Apparatus Department.

Don Stewart, who has been associated with several aviation firms in the past, has been made general manager of the aircraft division of the Bruning Co., Lincoln, Neb., and will be in charge of work on the company's quick disconnect couplings.

Eugene A. Raven, the new advertising manager of United Air Lines, takes over for **R. E. Johnson**, who was recently promoted to director of public relations and advertising. He joined United in 1944.

In the Sales Office

John W. G. Ogilvie has been appointed U. S. sales manager of Pan American Airways. Since 1947 he has been PanAm cargo sales manager. . . . Communications division of Bendix Radio has named **Arnold Rosenberg** general sales manager, and **R. B. Moon** assistant general sales manager. Rosenberg succeeds **J. W. Hammond** who has moved over to Bendix Friez Instrument division as director of sales. . . . Simmonds Aerocessories Inc. appointed **Baird Hodgkinson** ignition sales engineer. . . . **John W. Thompson**, formerly public relations director of the Air Transport Assn. now is vice president sales of Roland Reed Productions, Washington, D. C.

Changes & Appointments

Stephen F. Keating, director of military contracts of Minneapolis-Honeywell Regulator Co., has been elected an assistant secretary of the company. . . . **Carlo Re**, former structures engineer of Fletcher Aircraft, has joined the staff of Centaur Engineers, Inc., Burbank, Calif., to head the firm's technical divisions as chief engineer.

Mark F. Nevils, formerly Curtiss-Wright public relations director, now is eastern public relations representative for Boeing, with headquarters in Washington, D. C. He is taking over from **Carl Cleveland** who is returning to Seattle after a temporary assignment in Washington. . . . **Hans Lasker** has been appointed factory manager of PanAm Helicopter Corp., switching over from the same position at Republic Aviation.

Jack M. Slichter is the new director of flight schedules at Western Air Lines. He has been with the airline for four years.

PanAm has named **Fletcher G. Bennett** engineering experimenter of the Latin American division. He started with the airline as an accounting clerk 14 years ago.

Republic Aviation has signed auto for Federal Bureau of Investigation for its new director of security. He is **Albert J. Tuohy**, who has been a counter-espionage specialist on some of the FBI's biggest cases.

INDUSTRY OBSERVER

► **Highest-priced airplane the Navy is buying in its new procurement program is the search radar-equipped long-range Lockheed P2V patrol bomber, costing $1.25 million apiece. Douglas F3D twin-jet night fighter is the most expensive Navy jet on order, costing a little over $1 million per plane.**

► Wichita's personal aircraft companies, Beech and Cessna, expect to switch the bulk of their production to military contracts within the next few months. Cessna has major subcontracts with Boeing for B-47 airframe components, while Beech is preparing to convert to other military airframe business, and is opening a modification center at Herington, Kan., where it will install wing tanks on Douglas B-26 bombers as its first order of business.

► **North American F-51 Mustangs, top fighters of World War II, are continuing to return to service in many areas. Canada has just arranged to purchase 100 of the piston-engine fighters from USAF, while 51 reconditioned Mustangs were recently assembled at Lockheed Aircraft Service, Sayville, N. Y., for ferry flight delivery to European countries.**

► Canadian department of defense recently contracted with A. V. Roe, Ltd., to reactivate 50 Lancaster four-engine bombers for Atlantic and Pacific RCAF patrols, gave Canadair Ltd. an additional order for F-86 Sabre jet fighters, and placed an order in England for an undisclosed number of Hawker Sea Fury carrier shipboard fighters.

► **Original prototype Lockheed Constellation C-69 which has been used by the manufacturer for many tests and experiments will be used to try out the modification involved in the Model 1049 Constellation with 18 ft. longer fuselage. Navy has purchased this version under an R7O designation.**

► Douglas is expected to finalize a Navy order soon for 11 DC-6A cargo planes, equivalents of the Liftmaster prototype. They are 6 ft. longer in fuselage than the original DC-6s. The manufacturer still has not received any commercial orders for the cargo version.

► **Fairchild Packets are in action in Korea in cargo drops and in delivery of supplies.**

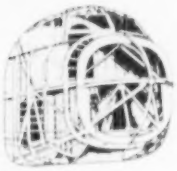
► New VIP Lockheed Constellation ordered for Gen. Douglas MacArthur, equipped with special radar and communications equipment, has been named the "SCAP" (Supreme Commander Allied Powers). MacArthur's pilot, Lt. Col. A. F. Story, took delivery of the SCAP at Burbank, last week, and was scheduled to leave immediately for Tokyo. Plane carries an outline map of the Japanese islands painted on its nose.

► **Production on the Navy's Chance Vought F4U-5N Corsair fighter, will continue for at least another year, on the basis of present orders, Navy spokesmen recently informed Congress. Navy has also finally approved a small production order for Chance Vought F7U twin-jet Cutlass fighters.**

► Biggest single order on the list of Navy planes is for Grumman F9F fighters. McDonnell Banshee jet fighters run second, with almost equally large orders.

► **Vickers Viscount 700, prototype of the production version of the four-turboprop transport ordered by British European Airways, made its first flight Aug. 28. The Viscount 700, like the earlier Viscount 630, is powered by Rolls-Royce Darts, but it will carry 40-53 passengers rather than the 25 seated in the Viscount 630. BEA, which has ordered 28 Viscount 700s, has been using the 630 in scheduled flights to Paris and within England.**

RUGGED



CHASE planes are designed and built to withstand severe landing shocks on short or unprepared fields, providing maximum safety to cargo and crew.

Examples of this ruggedness are the nose section of welded steel tube construction, and sturdy bulkhead between the flight and the cargo decks.

Chase AIRCRAFT CO., Inc.
WEST TRENTON, NEW JERSEY

AVIATION CALENDAR

Sept. 10-14—Instrument Society of America instrument conference and national exhibit, the Coliseum, Houston, Tex.

Sept. 12-14—Conference on ground facilities for air transportation, Massachusetts Institute of Technology, Cambridge, Mass.

Sept. 18-22—Fifth national instrument conference and exhibit, Memorial Auditorium, Buffalo, N. Y.

Sept. 19-21—Joint meeting on navigation and electronics, sponsored by the Institute of Navigation, the Radio Technical Commission for Aeronautics and the Radio Technical Commission for Marine Services, Hotel Astor, New York City.

Sept. 25-27—1950 national electronic conference, Edgewater Beach Hotel, Chicago.

Sept. 28-30—Aeronautic meeting and aircraft engineering display, Society of Automotive Engineers, Hotel Biltmore, Los Angeles, Calif.

Sept. 28-30—14th annual convention of International Northwest Aviation Council, Sun Valley, Idaho.

Oct. 5-7—Ninth annual convention, Air Line Dispatchers Assn., Congress Hotel, Chicago.

Oct. 9-12—Autumn meeting of National Academy of Sciences, General Electric Co. research laboratory, Schenectady.

Oct. 9-12—Fifth annual industrial packaging and materials handling exposition, Convention Hall, Philadelphia.

Oct. 12-13—1950 conference on airport management and operations, Max Westheimer Field, North Campus, University of Oklahoma, Norman, Okla.

Oct. 16-20—1950 annual general meeting of the International Air Transport Assn., Fairmont Hotel, San Francisco.

Oct. 18-20—Annual national conference of the Society of the Plastics Industry, Inc., in cooperation with Harvard Business School, Swampscott, Mass.

Oct. 22-28—31st annual meeting, American Welding Society, Hotel Sherman, Chicago, Ill.

Oct. 24-25—Third biennial Materials Handling Conference, sponsored by Westinghouse Electric Corp., Hotel Statler, Buffalo, N. Y.

Oct. 25-26—Flight Safety Foundation annual Safety Seminar, Denver, Colo.

Nov. 29-Dec. 1—Eighth annual meeting of Aviation Distributors and Manufacturers Assn., Ambassador Hotel, Los Angeles.

Dec. 16-18—4th Wright Brothers Lecture, Institute of Aeronautical Sciences, U. S. Chamber of Commerce Auditorium, Washington, D. C.

Jan. 15-18, 1951—Plant maintenance show and conference and conference on plant maintenance techniques, Cleveland, Ohio.

Jan. 29-Feb. 1—19th annual meeting of the Institute of Aeronautical Sciences, Hotel Astor, N. Y.

May 30-Sept. 9—World Transportation Fair, South Santa Fe, Anaheim, Calif.

PICTURE CREDITS

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NEWS DIGEST

DOMESTIC

CAB renewed feeder certificate of Pioneer Air Lines to Sept. 30, 1954. This is the first long-term renewal of a feeder franchise by CAB.

Shipments of executive-type and personal planes reached 296 in July for eight member companies of Aircraft Industries Assn. Total value of $1,628,000 includes 220 planes four-place and over, 76 one-place and two-place. Export of 19 planes was worth $102,487.

North American's B-45 Tornado can drop heavy bombs accurately at speeds over 500 mph. high-speed bombing tests at Edwards AFB have shown. Overlapping bomb bay doors slide upward inside the plane, so bombs fall directly into airstream, minimizing turbulence effect on bomb.

CAA has revoked nonsked registration of Golden North Airways, Inc., Fairbanks, Alaska. Golden was operating too frequently and regularly, says CAA.

Dr. Paul Rosenberg, consulting physicist, has been appointed general chairman of the ION-RTCA-RTCM joint meeting on navigation and electronics, to be held at Hotel Astor, New York, Sept. 19-21.

Aero Digest magazine, 23-year-old aviation monthly, was sold last week to Lincoln Press, Inc., Washington, by the heirs of Frank A. Tichenor, of New York, its long-time publisher. Fred Hamlin, head of Lincoln Press, and newly elected president and treasurer of the Aeronautical Digest Publishing Corp., plans to move publication offices of the magazine to his Washington editorial offices in the Warner Bldg.

American Aviation magazine has announced that it will shift to weekly from biweekly publication, starting with the Sept. 11 issue. Plan is to alternate "news editions," minus advertising, with regular editions.

George Lelsecut, Dayton representative of Fairchild Engine & Airplane Corp., died of a heart attack during a visit at the Hagerstown, Md., Fairchild plant.

Rep. Alfred Bulwinkle, long-time friend of aviation on Capitol Hill, and former chairman of the Transportation subcommittee of the House Interstate and Foreign Commerce Committee, died at his home in Gastonia, N. C.

Robinson Airlines' DC-3 crashed shortly after takeoff from Oneida County Airport (near Utica, N. Y.), killing 13 persons and injuring ten. It was the first fatal accident suffered by a certificated feeder operator.

TWA Constellation crashed in the desert west of Egypt's Nile delta, killing all 55 persons aboard. It was the first fatal accident involving a U. S. international flag carrier since April, 1948.

RDB Committee on Ordnance has three new industry members: John S. Newton, vice president in charge of engineering, Baldwin Locomotive Works, Philadelphia; James Fairman, vice president, Consolidated Edison Co. of New York; and Dwight T. Calkins, vice president, Atlantic Refining Co., Philadelphia.

FINANCIAL

Temco stockholders voted to increase the authorized number of shares of common stock from 500,000 $1 par value to 895,700 $1 par. A dividend was also voted of one share common for each share of common held. The stock dividend will be payable Sept. 15 to stockholders of record as of Sept. 5.

Parker Appliance Co. reports a net of $240,074 on sales of $7,101,701 for the fiscal year ended June 30. This represents earnings of 76 cents for each of the 322,882 common shares outstanding, and compares with a loss of $176,827 the previous year.

INTERNATIONAL

A. V. Roe Canada and the Department of Canada have started scheduled flights of 20 four-engined Lancaster bombers, put away at the end of World War II. They will be used by RCAF as anti-sub aircraft.

A. Tipos Belfan helicopter has set a new world record for its class, gross weight not exceeding 300 kg., by flying nonstop from Brussels to Brussels, 785 mi. Cost is product of Avions Laurs S. A. of Belgium.

BEA halved its losses this year as compared with last year. Fiscal year deficit was $7.8 million, will probably be far less next year.

Aviaca of Colombia is purchasing two C-46 cargo planes, bringing its cargo fleet to 13 planes. Lanes is considering a similar purchase, but has made no commitments as yet.

AIRBORNE

ALSO makes

BIG

ACTUATORS

FUNCTION

Stabilizer adjustment for swept wing version of a production A.F. fighter.

PERFORMANCE

Static Load Rating: 20,000 lbs.
Maximum Operating Load: 7,200 lbs.
Operating Speed: 1 inch per sec.
Weight: 22 lbs. (including Radio Noise Filter).

FEATURES

(1) Overload Clutch with external adjustment.
(2) Non-jamming Positive Overtravel Stops.
(3) Position Transmitter & Radio Noise Filter built-in.
(4) 1.65 H.P., 26 Volt D.C. Motor with Magnetic Brake & Clutch.

10 TON LOAD

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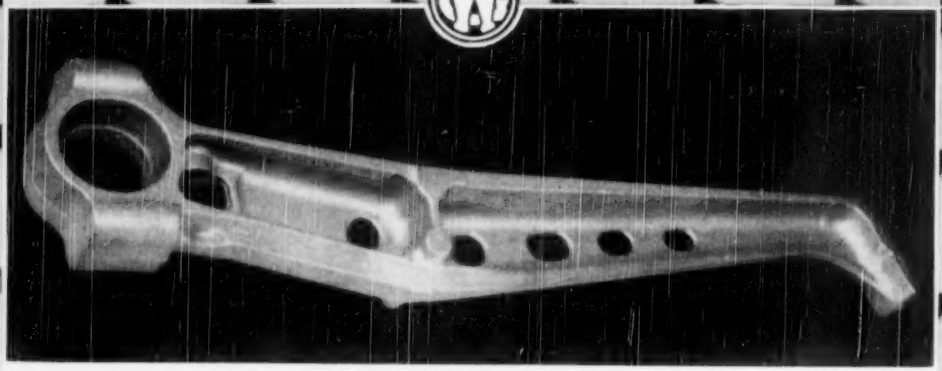


Another typical aircraft forging by Wyman-Gordon — with an over-all measurement of more than 45″ this intricate alloy steel forging is a vital wing support for a modern military bomber. For applications of such importance the best technique known in forging practice is essential, assuring scale-free surfaces, close dimensional tolerances, uniform minimum weight and maximum strength — There is no substitute for Wyman-Gordon experience.

Standard of the Industry for More Than Sixty Years

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel

WORCESTER, MASSACHUSETTS, U. S. A.

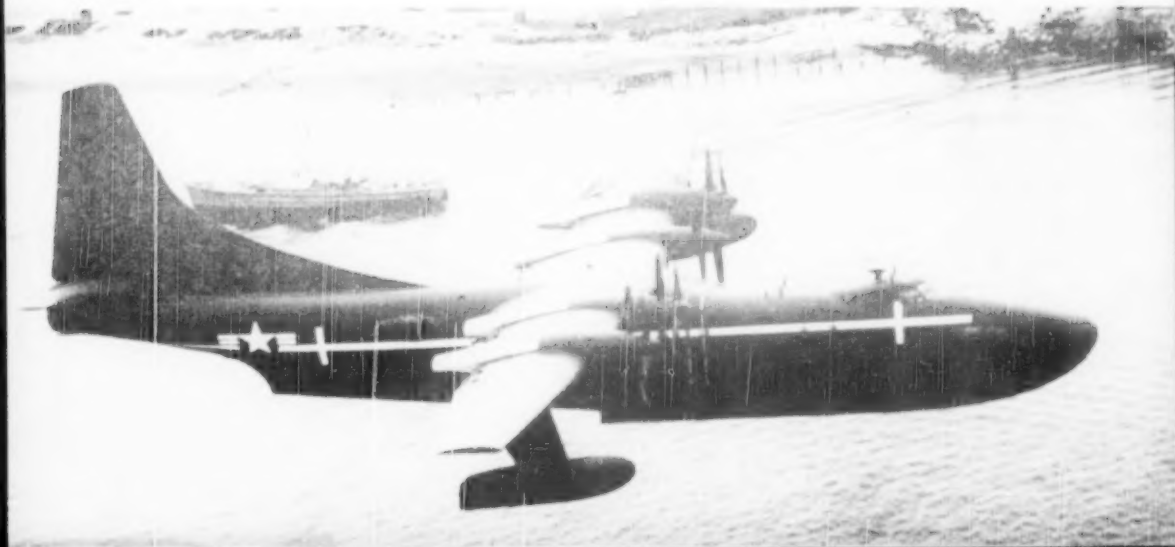
HARVEY, ILLINOIS - - - DETROIT, MICHIGAN

CANBERRA MK. 2, the production version of English Electric Co.'s twin-jet bomber, has new nose, provision for third crew member.

New Planes Show Increases In Performance

SAPPHIRE-POWERED METEOR (right) tests Armstrong Siddeley's latest jet engines, each rated at 7200 lb. static thrust.

CONVAIR XP5Y-1 (below) set a new endurance record for turboprops of 8 hr., 6 min. (AVIATION WEEK Sept. 4).



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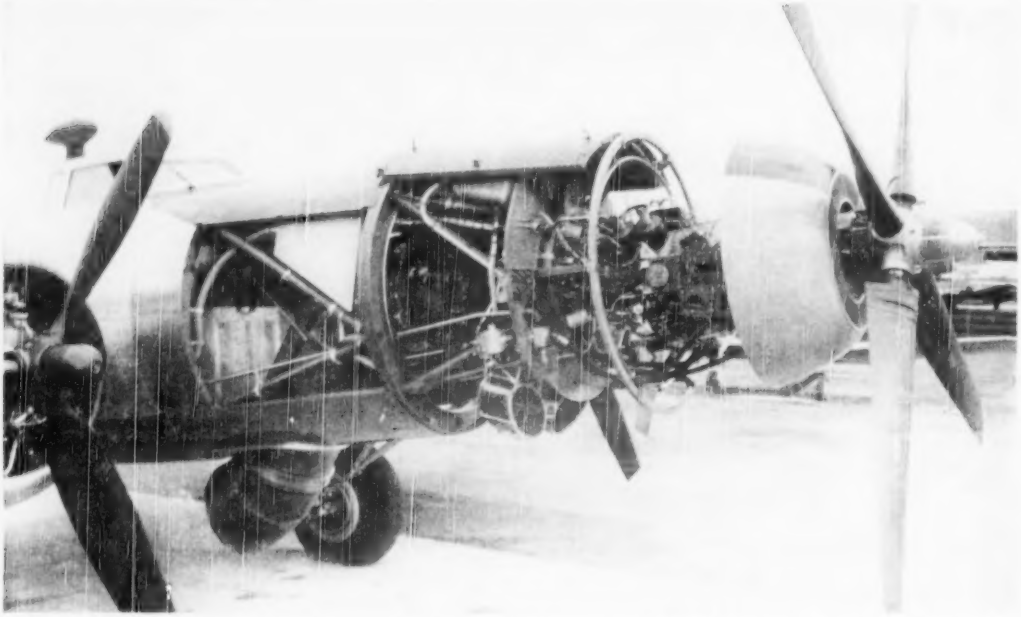


T-34 INSTALLATION in case of B-17 shows small diameter of 5700 hp. engine. Tailpipe below fuselage directs thrust horizontally.

P&W Reveals Most Powerful Turboprop

American and British Turboprops

Here is a comparison of American and British turbine propeller engines currently in development which have reached flight test stage. Figures are based on manufacturers' announced data.

Company	Designation	Horsepower	Specific Fuel Consumption	Weight Lb.	Diameter In.
Pratt & Whitney	T-34	5700	0.62	2550	70
Allison	T-40	5500	0.63	2500	46
Allison	T-38	2750	0.63	1250	20
Armstrong Siddeley	Python	4100	0.54	3100	54
Armstrong Siddeley	Mamba	1400	0.60	700	28
Bristol	Theseus	3000	0.80	2000	38
Rolls-Royce	Dart	1400	0.87	940	38

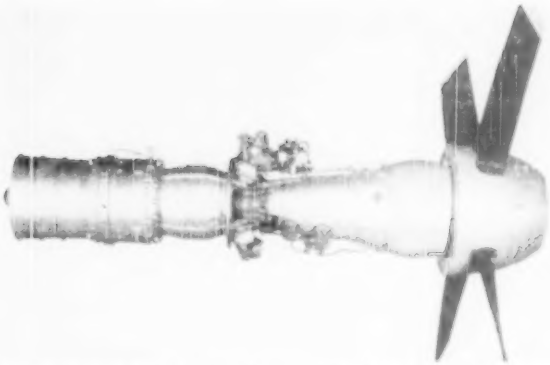
Big transport use seen for T-34, now being flight tested.

By Alexander McSurely

A new propeller turbine engine, described as the most powerful of its kind now flying, was unwrapped last week by its makers, Pratt & Whitney division, United Aircraft Corp.

The new 5700 hp. T-34 turboprop takes leadership in its class along with two other high powered Pratt & Whitney engines. Unsurpassed by other flying engines in their respective classes, in this country at least, are: The piston Wasp Major R-4360, rated at 4000 hp., in its latest compound version, and the J-48 turbojet engine, rated at 6250 lb. static thrust (without afterburner or water injection).

▶ **More Powerful**—The usually conservative manufacturer states that the T-34 is more powerful than any previously announced British or American turbo-



SLIM DESIGN of T-34 stems from axial arrangement. P&W's first engine of this type

POWER is displayed in flight with T-34 pulling B-17 with all four props feathered

prop that has reached flight test stage and that it also has a higher power-to-weight ratio and a lower specific fuel consumption, than any other such turboprop. (For comparative data see accompanying table.)

Effect on future airplane developments of the availability of the new engine may be far-reaching, in swinging additional emphasis to turbine propeller aircraft.

► **Transport Conversions**—It is understood that already the engine is being groomed to power turboprop conversions of the Douglas C-124 and Boeing C-97 heavy transports, and some may be chosen for a turboprop version of the Fairchild C-119 Packet.

It appears a reasonable assumption that the T-34 may be considered as an eventual powerplant replacement for the Wasp Major in virtually every airplane which uses the big piston engine. This would include not only the planes already mentioned, but the Boeing B-50 and Convair B-36 bombers, Convair XC-99 very heavy transport, Martin P4M-1 naval bomber, and the Boeing Stratocruiser, airliner development of the C-97.

► **Flight Rating**—The T-34 recently completed a preliminary 50-hr. flight rating test at 5700 hp. in good condition. Now it is continuing the experimental flight program, mounted in the nose of a Boeing B-17 Flying Laboratory modified as a test bed plane.

Since the fifth engine in the new series considerably more horsepower than all four of the current T2B8 big piston engines, it is possible to put three engines into the one, and fly the plane with the T-34 alone. On several occasions, Harold Archer, chief test pilot for P&W, has flown the plane on one of the fest.

► **Shaft Power**—About 90 percent of the power produced by the multi-axial flow gas turbine goes to the propeller shaft. The remainder becomes thrust proper, as it is exhausted in the fast gas.

Bare engine weight of the T-34 is 2550 lb., giving a power-weight ratio of better than 2 hp./lb. The engine is 137 inches long, and has a base diameter of 30 in. Specific fuel consumption is quoted at 0.62 lb./hr./shp.

Use of stainless steel as the principal material in construction of the T-34 has resulted in achievement of unusual strength with small weight penalty, the manufacturer states.

The first axial-flow turbine developed by Pratt & Whitney, the T-34 has a 13-stage axial-flow compressor, and a three-stage axial-flow turbine, used with an annular type burner.

► **One Control**—A single control lever is provided for the pilot. A system of mechanical controls linked to the lever automatically coordinates the fuel flow, propeller speed, flight speed and altitude for the power selected.

During the initial flight test program the T-34 has been turning a four-blade Hamilton Standard 50 integral section propeller with blades similar to those now used by Pan American Airways on its Boeing Stratocruisers. A special propeller brake keeps the engine from turning when the propeller is in full feathered position. Further improvement in engine performance is expected when special high-speed propellers now under development for the engine, are used with it.

► **Reduction Gear**—Propeller reduction gear is flexible coupled to the front of the compressor shaft, while compressor and turbine are rigidly coupled at the rear of the compressor case. The two-stage reduction gear operates at a ratio of 11 to 1.

Hot air is bled from the compressor for de-icing right in the air inlet area.

The engine will operate satisfactorily with either high octane gasoline or special aviation. Designed for 0.62 sfc, the fuel consumption during its 50-hr. tests. Such a rating, it is pointed out, compares well with the specific fuel consumption of high-powered piston engines in their highest power ranges.

The relatively small diameter of the T-34 in comparison with other units approaching its power output (such as the Allison T-40), gives the engine from East Hartford, Conn., an appreciable advantage. Simplicity of the single turbine unit, as compared to double power units geared to a single gear box, is another selling point.

► **Navy Development**—The new turboprop designated Model PT-2 by its manufacturer, was developed under Navy Bureau of Aeronautics sponsorship but has recently aroused considerable interest in the Air Force as a potential powerplant for bombers and heavy transports.

Once a few people knew that the T-34 had a big brother, a double set-up which the company called the PT-22. It was expected to attain around 10,000 shaft hp. rating. The double version was also a Navy development but was shelved at an early stage for lack of funds.

The B-17 flying test bed on which the T-34 is being tested was originally planned for the double turbine engine and still incorporates a double oil cooler system. Another interesting feature apparent on the B-17 installation of the T-34 is an odd extension of the tail pipe below the fuselage, designed to direct the jet thrust back horizontally, pri-

mainly to avoid heat complications with runway pavements.

Navy interest in turbine propeller powerplants for planes goes back at least as far as 1939. Two years later a Navy contract was awarded to Northrop to develop a geared gas turbine. Chrysler Corp., Allison division of General Motors and Pratt & Whitney later made development studies. The Allison single and double turboprop units were the first tangible results of this program in flying turboprop engines, followed a year later by the P&W development.

Navy flight research with turboprops is currently centered in two airplanes: the Convair XP5Y long-range high-speed flying boat, and the Douglas XA2D carrier-based attack plane. Both of these planes, powered with Allison T-40 engines, have progressed so successfully that first quantity orders for both are now being finalized.

Ignition Conference Meets at Toledo

The vital interest of the aeronautical industry in current ignition problems found expression last week in speeches and symposiums at Champion Spark Plug's annual ignition conference at Toledo.

Representatives of the airlines, engine and ignition system manufacturers, petroleum companies and interested government agencies devoted three days to discussion of the many complex questions posed by today's demands for high power, high speed and high altitude.

The first day saw the presentation of prepared papers dealing with spark plug research activities, effects of water injection on ignition systems, ignition analyzers, measurement of plug temperatures, and the Scintilla low-tension ignition system, among others.

The seminar last day was taken up by round table discussions of a host of ignition and related problems, and by trips through Cleveland's Detroit and Cleveland plants.

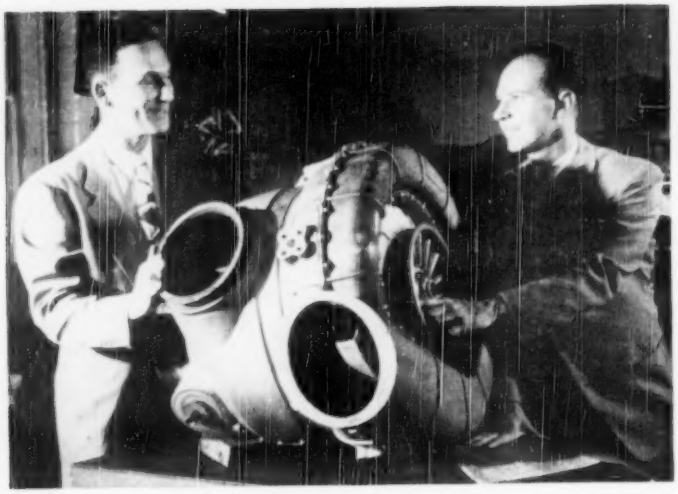
Lynn J-47 Output Stopped by Strike

Federal mediators last week were called in by affected settlement of a strike at General Electric Co.'s Aircraft Gas Turbine Division plants in Lynn and Everett, Mass., and the electronics department at Syracuse, N. Y. The work stoppage entailed production of J-47 jet engines and parts at Lynn, and turbosupercharger at Everett, the Syracuse factory produces electronics for both civil and military use.

The International Union of Electrical Workers (CIO) issued the call for the strike after negotiations broke down on wage increases and a new pension plan.

General Electric stated that some good had been made on wages, but that the company could not accept the union's proposal, which involves an insolvent non-contributory feature. GE's counting actuarily that provides for a contribution on the employee of 2 percent on the first $3,600 of earnings. The union asks that the company assume premium deductions on earnings up to $4,200.

At mid-week GE's Lockland, Ohio, plant, which assembles J-47 engines, was not affected by the strike.



GE's HURRICANE, the CH9 turbosupercharger, is inspected by two of the men who made it: M. K. Wolfson and W. O. Meckley, Gas Turbine division engineers.

Supercharger for Super-Power

A new turbosupercharger produced by the General Electric Co. for the Pratt & Whitney R-4360 Wasp Major engine is claimed to give the engine performance increases generally obtained only by compounding an engine—but the GE development skips what until now has been a main feature of compounding.

The new turbo, the CH9, is not mechanically connected in any way to the engine. Compound engines in the past have relied for additional power primarily on harnessing the turbo thrust to the crankshaft through gearing. Key to the CH9 compared R-4360 performance is more efficient compressing of air.

Here's what GE says the Wasp Major and the CH9 can do:

- **Increase takeoff** power by 72 percent.
- **Lower fuel** consumption from 6 to 26 percent.
- **Increase payload** by as much as 75 percent on a flight from San Francisco to Honolulu.
- **Increase speed** by about 40 mph., and increase payload 7000 lb. on a flight from Boston to St. Louis.

To do this, GE claims the CH9 handles up to 550 lb. of air a minute, compressing it to a pressure of 50 in. of mercury absolute. And with accessories the CH9 weighs 300 lb. Specific fuel consumption of 0.36 lb./hp./hr. can be achieved. The unit also provides cabin air conditioning up to 50,000 ft.

Development of a direct fuel injection system on the R-4360 paved the way for elimination of the geared supercharger. The CH9 now provides full engine manifold pressure. An aftercooler reduces cylinder intake temperature by as 45 percent, making possible greater power.

AF Development Center Pushed

Rapid construction of the Air Force's Air Guided Missile Development Center is being pushed by Congress.

Rep. Carl Vinson, chairman of the House Armed Services Committee, and Sen. Lyndon Johnson last week introduced bills requested by the Dept. of Defense increasing authorization for the center from $100 million to $137 million.

A high-altitude engine test chamber and a hypersonic and a supersonic wind tunnel are being built.

XC-123 Seen in Lead in Evaluation

Chase assault transport, followed by Northrop C-125 and Fairchild C-82, seems to be leading Eglin study.

By Ben S. Lee

Eglin AFB, Fla.—An tactical support needs of the Army are set for a boost—at least on paper—this week, as results of the assault transport evaluation are being tabulated for transmittal to Washington and Air Materiel Command for final decision.

While evaluation missions are still under way at Eglin as this is written, results of the tests based upon completed missions will probably place the Chase XC-123 in first place, Northrop C-125 in second place and the stripped-down Fairchild C-82 in third place.

This would mean that Chase Aircraft Co., Trenton, N. J., will be asked for quantity production of the C-123 with a lesser contract for its light YC-122C transport. USAF has evidenced considerable interest in the YC-122, but favors more powerful engines in place of present two-engine R-1820-101 equipment.

To meet immediate service needs of the Army (Aviation Week, Aug. 28), USAF will order conversion to the assault transport category of a sizable number of the 200-odd C-82 Packet transports already in service. Conversion program for the Packet, estimated at between $35,000 and $40,000 per plane, includes structural beefing of the beams, forward portions of the fuselage, and landing gear plus installation of reversible propellers.

▶ **Description**—Planes competing at Eglin Air Proving Ground Command are the Northrop C-125A, Chase YC-122C and XC-123, Fairchild (modified) C-82, and the Chase gliders YG-18A (YC-122) and the XG-20 (XC-123).

• **All the planes and gliders** are all-metal high-wing monoplanes. Each has a built-in loading ramp, permitting easy loading access to cargo compartment from the rear.

• **All are heavily reinforced** to permit landing and takeoff in extremely rough terrain and to provide crash protection for crews and occupants.

• **The planes are classified** as light and medium assault aircraft—the light is designed to carry 8000 lb. of cargo, the medium 16,000 lb.

• **The transports** are supposed to be capable of being towed as gliders as a means of extending their range.

▶ **Ferry Transport**—USAF has asked for a medium cargo assault transport to ferry combat and engineer equipment for airborne assault troops. Requirements:

• **Performance**—Takeoff over 50-ft obstacle, 2000 ft.; landing over 50-ft. obstacle, 1500 ft.; rate of climb at sea level with normal rated power, 700 ft./min.; service ceiling at normal rated power, 15,000 ft.; service ceiling with one engine inoperative, 5000 ft.; maximum speed at which aircraft can be flown with full control, 78 knots; minimum cruising speed, 130 knots; range with maximum cargo at optimum cruising speed, with self-sealing tanks, 650 nautical mi.; reserve fuel for 650 nautical mi. range, 1 hr.

• **Armor, armament and protective systems**—Self-sealing tanks for fuel and oil; fire hazard on crash landing to be reduced by self-sealing tanks and fuel purging; armor protection against small arms fire for the engine nacelles; provisions for standard pyrotechnic signals.

• **Crew and cargo capacity**—Crew of two, a pilot and co-pilot; also complete provisions made for the addition of a radio operator and navigator for long range operations; cargo compartment dimensions of not less than 35 ft. long x 8.8 ft. wide x 7 ft. 11 in. high. Cargo box of transporting 8000 lb. (light) or 16,000 lb. (medium) of bulk equipment.

• **Equipment**—All current standard flight and engine instruments; complete radio navigational and interphone equipment; provisions for a ferry range of at least 2600 nautical miles in still air; standard lighting system for 24-hr. operation including cargo loading lights.

• **Other features**—Provide crash protection for the crew and belly reinforcement for Arctic operations; seat provisions for the maximum number of combat troops and equipment at 240 lb. each; plus provisions for the installation of the maximum number of litter patients with two attendants per eighteen litters plus oxygen provisions for the crew and passengers; landing gear heavy enough to permit landing in cultivated fields, cross furrows, and in rutted open terrain using multi-wheels or caterpillar treads; provisions for towing of the aircraft as a glider, including interphone to the tug.

▶ **Scope of Test**—USAF seeks to determine whether powered transports can equal or better short field landing performance of the gliders in each weight class. Secondary evaluation (to be conducted later at Ft. Bragg) is to determine the suitability of each assault transport for employment in parachute troop operation including troop and equipment drops. This phase, however, has no bearing on show competition for assault transport needs.

The tests will examine:

• **Ease of operation** from the air crew's standpoint, including low altitude maneuvering, formation flying, instrument flying, night flying, single engine characteristics, short field landing techniques, visibility, cockpit arrangement and comfort.

• **Rough terrain takeoff** and landing performance over a 50-foot obstacle. (Takeoff for gliders accomplished by a C-54 in a match pickup.)

• **Hard-surface takeoff** performance. (Takeoff for glider with a C-119B tug.)

• **Range and radius** performance with design cargo load under formation flight conditions with maximum fuel and with protected fuel only. (C-119B tug for gliders.)

• **Extension of radius** achievable by using tow technique on assault transports. (C-119B tug.)

• **Ease of transporting** typical items of ground force equipment and supplies and Air Force engineering equipment.

• **Ease of evacuating** litter patients from combat areas.

• **Difficulties encountered** in paratroop and parachute resupply operation.

• **Difficulties encountered** and time required for maintenance.

• **Ground handling** and maintenance equipment required.

▶ **Entries Damaged**—Eglin test pilots are throwing the text book at all competing aircraft. Field 8, where the tests for rough landing and takeoffs are staged, is a large 30-ft and weed patch, rutted, and marred from previous equipment and explosive tests. The test analyzes the pilot ingenuity in missions flown, and the company representatives' feelings for his product.

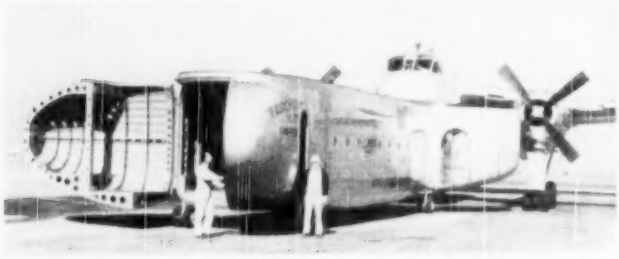
In the tests so far completed damage was suffered by each competing aircraft and plane in either takeoff or landing missions. Air Force spokesman conducting the tests claim that the evaluation has imposed greater stress on the competitors than would likely be encountered in actual operating conditions.

During the first week of operation, the Chase G-20 was damaged when a tow rope snapped and tore into the fuselage just below the pilot compartment. The stripped-down Fairchild C-82 making a short landing over a 50-ft. obstacle (two poles 50 ft. high with yellow flag marked wire suspended between) hit tail first and snapped off the left boom and horizontal stabilizer.

Chase XC-123 making a similar type landing taxied into a sand-filled bomb crater, slewed around and twisted the left landing gear arm. The G-18 glider landed with nose wheel up and suffered considerable skin damage.

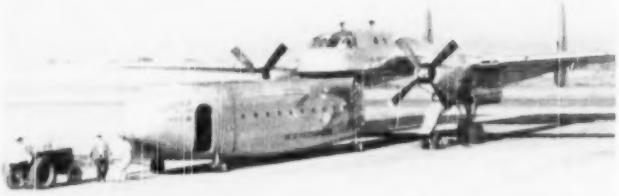
The Northrop C-125A in a similar attempt bent the center engine prop on one landing and broke a landing gear on a second pass.

HALF A PLANE in flight is better than one plane on the ground because the XC-120 goes for more freight while pack is unloaded.



MAMMOTH DOORS of detachable pod give access from both the front and rear.

Fairchild's Versatile Packplane



POD DETACHED from packplane rolls away on wheels stored inside in flight.

TOW BAR is as unusual as rest of plane, extending between nose wheels.

COLLAPSIBLE LADDER extends 14 ft.

XC-120: Tomorrow's Cargo Plane?

Tractor-trailer arrangement cuts ground-handling time sharply; said to triple transport efficiency.

Hagerstown—An exciting new phase of air cargo lift is having its beginnings here in the flight and ground tests of the new Fairchild XC-120 Packplane.

This first experimental tractor-trailer-truck of the air has its crudities, but even so, it works. And it opens the promise of multiple savings in ground-handling time. This plane and its descendants may well cut off a bigger slice of the total transportation business for airfreight than the most enthusiastic air cargo apostles previously dared hope.

▶ **Watch It**—Watch with the crowd of Hagerstown folk on the highway outside the airport and with the Army and Air Force and the newsmen on the field as the XC-120 shows what it can do.

Grotesque in its bulk, the Packplane looks like the overpaint caricature of a fat-bellied pouter pigeon as it waddles down the runway bouncing on its eight-wheeled landing gear.

Dick Henson, Fairchild chief test pilot, accentuates the plane's waddle as part of his showmanship, then rocks back the XC-120 on its rear wheels and climbs it into the air.

Back it comes for a smooth landing. And then, things happen fast. Within four minutes, the pack is detached from the upper portion of the plane, and is trundled away on its own wheels behind a sturdy airport tug.

Meanwhile Henson takes the packless XC-120, which now looks like a mixture of grasshopper and P-38, into the air for a second spectacular flight demonstration. The plane breaks ground in less than 500 ft. and climbs and dives almost like a pre-jet fighter.

▶ **What It Means**—What does it all mean from a military cargo standpoint?

Maj. Ray Hack, USAF cargo expert at MATS headquarters, has an answer, in terms of the Berlin Airlift.

"It is my opinion that the detachable cargo compartment will virtually triple the transport efficiency of aircraft, as applied to military operations. If a detachable cargo compartment aircraft of the XC-120 type had been used during Operation Vittles, a saving of approximately 50 percent could have been effected. From a rough 'guesstimate,' it is figured that approximately 120 aircraft of the detachable cargo pack type, equipped with three packs each, would have been needed to carry the daily requirements into Berlin."

▶ **Attachment Fittings**—Four small metal knobs on the top of the pack compartment attach into four sockets in the belly of the cabin compartment. A single control in the cockpit releases the clutch of metal "fingers" at all four attachment points simultaneously, so the pack can be dropped in flight if need be.

But when the pack is detached in a normal ground-handling operation, it is lowered by four sturdy steel cables hooked to the pack's sides. Four electric motors in the cabin compartment—4-hp. motors at the aft-most and 2-hp. motors at aft position—lower or raise the pack by paying out or reeling in the cables.

In ground tests, the load apparatus has been tested up to a combined weight of 56,000 lb. distributed 15,000 lb. on the front hoists and 38,000 lb. on the rear hoists—although it is calculated the maximum gross load for the pack will be 25,200 lb.

Dual wheels with low pressure tires are quickly fitted at the four corners before it is lowered. Front wheels swivel for steering and have tow-bar fittings so that it may be towed from either front wheel. The ground-handling wheels are stowed in the pack when it is attached to the plane for flight.

▶ **Inflated Seal**—A rubber tube around the top edge is inflated when the pack is attached to the crew cabin, so that a tight seal is made at the junction point.

The pack has front and rear double clamshell doors and its floor is horizontal and about 4 ft. from the ground when it is attached to the plane in normal ground position.

▶ **Cargo Space**—The pack provides 2,700 cu. ft. of cargo space in the following dimensions: Height, 8 ft.; width, 13 in. above floor, 9 ft. 2 in.; width above 15 in., 9 ft. 8 in.; length, 36 ft. 9 in. The cargo space is essentially the same as that provided in the Fairchild C-119 Packet cargo plane, from which the XC-120 has been developed.

The Packplane is designed for a 64,000-lb. gross weight, a maximum speed of over 250 mph. and a service ceiling with two engines of over 25,000 ft. It will carry 36 litter patients, or 44 troops (normal), or 64 troops (maximum), or 20,000 lb. of cargo.

▶ **Unique Gear**—Main landing gears of the Packplane are similar to those of the C-119, but two auxiliary wheels are placed forward of each landing gear. The forward wheels are interconnected with the main wheels by a mechanical linkage and retract into the nacelles as the main wheels retract. Auxiliary wheels are free-rolling and steerable with a differential hydraulic steering arrangement, governed by a small hand wheel in the cockpit. So much space is required to contain the gear in retracted position that it was necessary to lengthen the nacelles 30 in. by inserting an extra section.

The landing gear retraction is electrical, developed by the Lear Corp. An emergency provision releases the clutch of the electric actuators, allowing the gears to fall free in the down position, with a final hydraulic boost to lock them in down position. Main wheels have hydraulic brakes.

The powerplants, two Pratt & Whitney R-4360 engines of 3,250 hp. turning Hamilton Standard 13-ft. diameter propellers, are similar to those used on the C-119. Outer wing panels, empennage and tail booms, except for the extra 30-in. sections, are identical with those of the C-119.

As soon as the Packplane gets a little more time in the air, it will be the subject of a number of interesting experiments in an effort to determine the full military utilization of such a novel air carrier.

▶ **Parachute Drop**—Dropping the pack by parachutes is probably the first order of business. A little later the pack may be dropped from very low level, without parachute. It is not unlikely that the carrier plane may be used later, if all goes well, to haul and drop other objects than the original pack, perhaps a tank, or field gun in a temporary fairing to lessen wind resistance.

Design of various specialized pack interiors, as field hospital units, photographic laboratories, air-portable machine shops, etc., is also in the future picture.

Fairchild now has under consideration another Packplane version which fits the pod or pack into a nose section more nearly like that of the C-119. While this eliminates the front clamshell door arrangement used on the XC-120 pack, it makes possible use of the C-119's nose-wheel landing gear arrangement which has some obvious advantages over the quadricycle gear used on the XC-120.

Another advantage would be in saving about 1000 lb. in weight over the XC-120 arrangement, presumably mostly in the landing gear.

▶ **Earlier Tests**—Pods and packs have been the subject of many previous experiments. British engineers developed a gosdetic construction pack in which they proposed to drop infantry in World War II.

It has been estimated that it might take as many as 14 of the 100-ft.-diameter Air Force cargo chutes to lower an XC-120 pod successfully. However, use of rocket-assist units to slow down the rate of descent, with a couple of parachutes at the ends of the pack for stability, is also being considered.

What's Ahead in Congress

▶ **Strategic air** will be strengthened, although tactical aviation has priority for the time being. The reason: The North Atlantic Pact commits its 12 members to regard an attack on one as an attack on all. This means that if Russian troops invade European signatories, unprepared for war, the U. S. will retaliate with long range bombings on Moscow.

▶ **Air preparedness**, or lack of it, is being pushed into the political arena as a campaign issue by the GOP. The lead editorial in the Republican National Committee's "On the Political Front," attacks the President for impounding 1950 fiscal year Air Force funds and sabotaging legislation authorizing a 70-group USAF, which wasn't signed until two weeks after South Korea's invasion.

▶ **69 equals 70?** Secretary of Defense Louis Johnson's critics on Capitol Hill are sarcastic about his "new program" for a 69-group USAF. They claim it's just the old "70-group program with a new face to save face for Johnson who opposed the 70-group program and now finds it distasteful to endorse it.

▶ **Aircraft contracting** will move full steam ahead. Congress has completed action on a resolution allowing USAF and the Navy to spend funds contained in the $16-billion defense supplemental bill. Senate action on the measure is being slowed down by office hours—

▶ **A new WPB** is in the wind. This is why Colorado's Sen. Edwin Johnson proposed that all allocation and priorities control be put under the Secretary of Commerce. "So all these activities would be in one place and could be easily shifted to a new war production board when it comes." His proposal, urged in the Senate, but eliminated from the final version of the emergency priority bill sent to the White House.

▶ **Marine aviation** will get a hunk, right out of a $900-million supplemental to the Congress scheduled to reach Congress by January. The Marine Corps now has a $528-million program for this year, which the supplemental will more than double.

▶ **Electronic, radar equipment**. Heavy requests for procurement will be included in the $10 billion supplemental, now in the mill at the Department of Defense, and set for submission to Congress anytime between now and January.

▶ **National Science Foundation** is probably out for another year. The House turned down $250,000 for organizing the foundation so that it could launch its $15-million-a-year program to promote basic research and development next year, and the Senate is expected to pursue a tight rein over the matter.

▶ **Plant security**. Count on Congress to give the President sweeping power to change legal security requirements on aircraft and other defense plants and installations and provide criminal penalties for violations, even through negligence.

▶ **Surplus engine sales**. The Inspector General's Office in cooperation with the Senate's Defense Appropriations subcommittee, headed by Sen. Lyndon Johnson, is investigating sales of surplus aircraft engine sales. Johnson is miffed on the angle of the investigation.

▶ **Guided missiles**. A House Armed Services subcommittee, headed by Rep. Edward H. Rees, will take off for a spotcheck of guided missile installations next month after the November elections. The group has held consultation sessions with top scientific and military and intelligence officials. Rep. James Van Zandt commented: "With German assistance, Russia has the lead. Our program will have to be stepped up. We want to decide how, and how much."

▶ **Plane costs** will soon be looked into by a House Armed Services subcommittee, headed by Rep. Paul Kilday. Reports are current that fewer aircraft can be procured than planned because of cost rises.

▶ **AF Electronics Development Center**. The odds for congressional approval are now better than 50-50. It would be located at the $60-million Griffiss AFB, Rome, N. Y., and consolidate work now carried on at Wright Field, the Watson Laboratories at Eatontown, N. J., and Cambridge Field Station, near Boston. New Jersey congressmen oppose the Rome location, but USAF reports the cost of establishing the center there would be only $3 million, compared with $18 million mostly for buildings, at Eatontown.

▶ **Tax write-off**. Stepped-up amortization for aircraft and other defense plants to spur construction appears set. The proposal approved by the Senate permitting write-offs of plant costs for tax purposes of 20 percent a year over five years, instead of 10 percent a year over a ten-year period, will probably be cleared by the House.

▶ **12.5-million testing program** for new commercial prototypes is set for enactment. The Administration has pushed it out of the House Interstate and Foreign Commerce Committee, where it was dallying while committee members aimed to work out a large-scale program. Aircraft manufacturers partly because of heavy military business, are tied to a full-scale commercial plane development program at this time.

▶ **CAA cutback**. CAA's $230-million budget for this year is in for a sizable reduction under the congressional directive to the President to trim $500 million off the $35 billion appropriated for government agencies. CAA had a $207-million budget in the 1950 fiscal year.

▶ **CAB chairmanship**. Independent air carriers are mixing a campaign to get congressmen to pressure the White House to fill the vacancy with a spokesman for their case against the scheduled carriers.

▶ **Tax dodging**. Congress will soon end widespread evasion of the 15 percent airline tax through ticket purchases outside the country. A provision included in the new tax bill will require that the tax be paid on all trips beginning and ending in the U. S., regardless of where tickets are purchased.

New Laws

Congress has completed action on measures which:

- Give CAA authority to control air movements over restricted areas during an emergency.
- Authorize $ 814-million new airport in the security of the District of Columbia.
- Set up a clearing house at the Department of Commerce for the collection, dissemination, and exchange of scientific, technical, and engineering information.
- Provide for the protocol of the zone of aviation prominence in the enlarged section of the terminal frieze of the extension of the Capitol. The President has already signed this bill into law.

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Why Grumman chooses MONEL TUBING for their newest amphibians . . .

When it came to the question of hydraulic and fuel pressure system tubing for their ultra-safe amphibians, the *Mallard* and *Albatross*, Grumman engineers demanded three things:

1. High strength-to-weight ratio
2. Resistance to heat, corrosion and vibration
3. Ease of fabrication

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- ***Ductility***: MONEL does not work-harden excessively. It is, therefore, easy to cold form, yet is considerably more resistant to flexion cracking than many other metals.
- ***High strength and toughness***: MONEL is stronger than mild steel; increases in strength at sub-zero temperatures.
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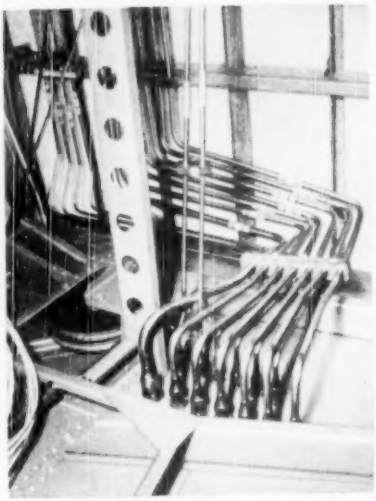

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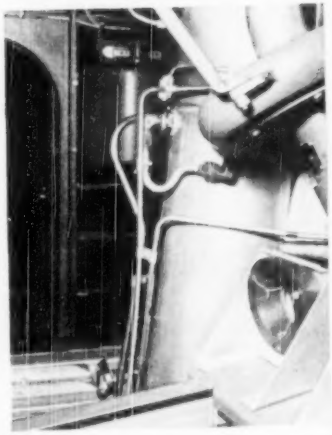

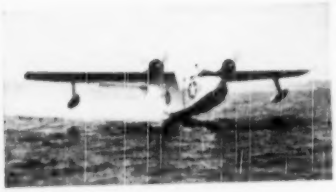

(*Left*) Grumman JRF *Albatross*. Air-sea rescue amphibian built by Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y. (*Center*) Grumman *Mallard*. This is the first amphibian to pass the latest, more stringent Civil Aeronautics Administration's tests to qualify for a Scheduled Air Carrier Operations rating. (*Right*) MONEL tubing used for fuel pressure lines in the Grumman *Mallard*.

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Getting the Best from Turbine Transports

BOAC expert analyzes the basic considerations to achieve optimum operation with new power scheme.

By Christopher Dykes*

Britain has by now made construction a number of turbine engine transports—the Bristol Brittania, Bristol 175, de Havilland Comet, Vickers Viscount, and Saunders-Roe Princess flying boat—as well as several prototypes from other firms.

When the first of these orders was placed through the vision of those then in charge at the British Ministry of Aircraft Production and British Overseas Airways Corp., in 1945, little was known about how they could best be operated, and the payload-range calculations were elementary. The succeeding years have given time for careful thought on problems of actual operation and have led to methods of improving the economy of such aircraft, hence to extending their usefulness, by careful choice of cruise control procedure.

Previously, much of this work has rested only on theory without the test of experience, for though the first Comet has chalked up the stupendous total for a prototype of 320 hours flying in its first year, most of this has been occupied with aerodynamic testing not directly related to the problems of airline operation. Everyone who has had to do with prototype flight testing will know that this is essential. However, enough long-range flights have been carried out to indicate the soundness of the principles reached theoretically. In view of the great interest in the subject it is believed that AVIATION WEEK readers would like a review of these conclusions, to see how we mind ly if we are to get the best out of these new turbine transports.

▶ **Fundamentals**—First of all, we must go back to the essential differences between turbine aircraft and present piston planes. The most striking is the higher fuel consumption. Though turbines, and particularly turbojets, are lighter than piston engines of the same power, the specific fuel consumption is much greater at the speeds of transport aircraft. For short distances, the payloads of turbine aircraft therefore will be greater. But if we are to get the same range from a turbine as from a piston without loss of payload, every possible device for improving the miles per gallon must be employed.

Even apart from possible gain of payload, any improvement in mpg. will yield a greater reduction in operating costs than with present aircraft, because fuel accounts for 25 to 30 percent of the direct operating costs on a piston aircraft, but for as much as 40 to 45 percent on the Comet.

Secondly, aircraft operating costs depend fundamentally more on the block to block speed than on the cruising speed. But the higher the cruising speed, the further the block to block speed tends to fall short of it.

At a cruising speed of 200 mph., a gain of 10 mph. will yield about 4 percent gain in b-b speed; at 400 mph., even a 20-mph. increase in cruising only gives a 3 percent gain in b-b speed.

In fact, the high speed of future transports itself renders it more difficult to turn the increased speed to full advantage.

From these two principles it follows that no increase of speed is likely to be worthwhile in a turbine craft if it is only obtainable at the expense of increased fuel consumption.

A third point is that for a given altitude and a constant turbine rpm., a turbojet is essentially a constant thrust device. Since power is the product of speed and thrust, the power increases as the speed increases. On the other hand, the horsepower of a piston engine tend to some extent that of a turboprop tends to decrease with increase of speed, due to loss of propeller efficiency at the speeds we are now considering for transport aircraft.

The last an important effect on the indicated speeds for maximum mpg. and for minimum throttle opening, both of which are higher on the turbojet than on equivalent piston craft.

At first sight, these higher speeds look to be an advantage in permitting us to cruise turbojets at the exact speed for the greatest mpg., whereas every operator knows that on piston aircraft, the most economical speed is usually below the minimum comfortable speed. Unfortunately the minimum control speed of the turbojet also goes up, so we are left very much where we were.

The transition of turbine transports from the design, construction and proving stage into the operating regime will place the airlines in the position of getting the most out of these high-speed, high flying craft.

It is already evident that the operator will have a considerable number of new and tricky problems to solve with these new transports.

Cruise control procedure perhaps is the most complicated of these. That's why AVIATION WEEK *commissioned this article. To show the operator contemplating the use of turbine craft just how scientific he will have to be.*

This presentation is based on extensive research that British Overseas Airways Corp. has conducted in anticipation of the introduction of turbine transports on its routes. It was written by BOAC's Christopher Dykes at the suggestion of McGraw-Hill's London Bureau Chief Frederick R. Brewster, who planned the article with him. Dykes is engineer in charge of development, whose chief job has been the preparation of plans for operation of the turbine planes BOAC has on order—14 de Havilland Comets powered by 4 Ghost turbojets, 23 Bristol 175 Brittanias with 4 Proteus turboprops, and 3 Saunders-Roe Princess flying boats powered by 10 Proteus turboprops.

▶ **Optimum Operation**—With these fundamentals in mind, we can now appreciate their effect on the operation of turbine transports—both turbojet and turboprop—and reach certain general conclusions for optimum operation.

• *High operating altitudes are necessary for economy.*

This is because the consumption of a turbojet in lb./hr. is primarily dependent upon the thrust and varies very little with speed over the cruising range. The same thrust, however, drives an aircraft faster the higher it flies, so that the mpg. are greatest at high altitudes. Actually, because the thrust falls off with increasing altitude, the speed starts to fall off at an altitude usually between 27,000 and 30,000 ft., though

*Chief Engineer, Development, British Overseas Airways Corp.

TABLE I

Cruising Speed and Altitude Trends

Aircraft	Condition	Altitude (ft.)	Speed (mph.) Indicated	Speed (mph.) True
DC-4	Max. cruise	10,000	194	223
Constellation 749	Max. cruise	20,000	231	317
Stratocruiser	Max. cruise	25,000	219	323
Comet	Constant (modern)	38,000	256	473
	Overall Increase	28,000 ft.	32%	119%

Note: The speeds are given at mean weight and ICAN standard temperature.

the amps. continues to improve until very close to the ceiling.

While these high altitudes are necessary for economy, they are also the means whereby we get higher speeds. Table I illustrates this point. It will be seen that in the last ten years the cruising speed of transport aircraft has more than doubled, from the DC-4 at a maximum of 223 mph. to the Comet at 473 mph. Most of this is due to the increase in cruising altitude from 10,000 to 38,000 ft., for the indicated cruising speed has only gone up 32 percent, and, as we stated above, some of this (about 20 percent) is due in any case to the characteristics of the turbojet as a power unit.

Incidentally, those who like to peer into the future may deduce from this that the practical operating height probably sets a limit to the maximum speed of future transports. For instance, it already appears that there is a critical height above which it is necessary to make an immediate dive if there is any failure of the pressurization system. No operator can consider operating above 40,000 ft. until he has gained considerable experience of the reliability of such systems at altitudes between 35,000 and 40,000 ft.

• *Cruising will be carried out at the maximum practical rpm., preferably at the maximum continuous rpm. permitted by the manufacturer, though this may have to be limited by considerations of obtaining reasonable overhaul life.*

There are two reasons for this. First, because of the higher altitude permitted by the higher power, and second, because one of the characteristics of prevailing turbines is the rapid rise in the specific consumption with reduction in rpm. The effect of a decrease in rpm. is to reduce power. From what we have just seen, this reduces the cruising altitude, which also increases the specific consumption, and the combined result is a large loss of speed as well as a loss in amps.

The fact that with turbine aircraft both the maximum speed and the most economical procedures are obtained at the same rpm. (max. cruising), though at different altitudes, is probably the most noticeable operational difference from piston aircraft.

• *For medium and long ranges the cruise will be carried out at a slow climb.*

As the flight progresses and fuel is consumed, the weight will fall and the aircraft will tend to go faster. If we stay at the same altitude, then the amps. will increase only to the same extent as the speed.

A much better procedure is to allow the aircraft to climb slowly so as to keep approximately the same amount below the ceiling. The rate of climb will be only 50-40 fpm., which will not have much effect on the forward speed.

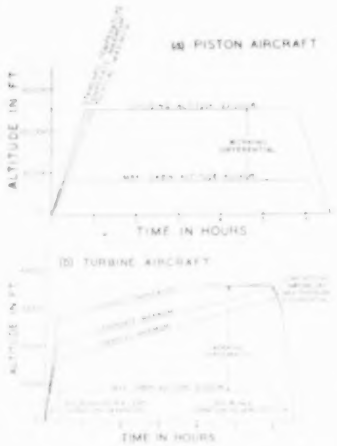

Fig. 1. Typical flight plans (a) for piston engine craft and (b) for turbine engine craft, showing limitations imposed by maximum pressure differential. Temperatures refer to BCAR standards. "Temperate maximum" is equal to ICAO "temperate" and "tropical maximum" is 6 F. hotter than CAA "hot day." Altitudes are appropriate for craft with simple turbojets—compression ratio 4:1 and takeoff thrust loading 5 lb./lb.

but will appreciably improve the amps.

We cannot tell exactly how fast we should climb until we go into the matter more deeply (the best method is given later); it is sufficient here to show that you should climb and not stay at the same altitude.

• *The maximum rate of climb should be used to attain economical altitudes as fast as possible.*

This more or less follows what has gone before. The climb will be done at maximum climbing rpm. and at the speed for maximum rate of climb. Because the forward speed is fairly high the distance covered is considerable.

Normally the converse will hold true, and the descent will be carried out in as short a time as can be done. There are, however, some limitations. First, the pressurizing system may not be able to maintain the desired steady increase of cabin pressure at 200 to 300 fpm. if the rate of descent exceeds, say, 3,000 fpm. Second, very high rates of descent are associated with forward speeds which may reach critical Mach numbers. Even if this is not the case, it may be unnecessarily uncomfortable for passengers as turbulent cloud layers are pierced.

The solution may well be to use dive brakes and zero thrust, though in this case the angle of the cabin may appear somewhat alarming. Taken all in all, we cannot yet say which is the best method of descent, and it is noticeable that at the recent IATA Technical Conference at Asbury Park, N. J., this was one of the few points on which there was diversity of views between jet manufacturers.

• *The flight plan is highly sensitive to changes in ambient air temperature.*

While most people are aware of the temperature sensitivity at takeoff, it also applies to the cruise, and this may require some explanation. With all types of engines, an increase in air temperature results in a loss in power, and normally also in an increase in specific consumption.

On turbine aircraft, however, the loss in power causes an additional loss of altitude and hence a further reduction in specific range. Those readers who are interested in obtaining actual figures should refer to the Thirteenth Wright Brothers Lecture given by A. F. Russell, chief designer of the Bristol Aeroplane Co., in Washington, on Dec. 17, 1949. From one of Russell's charts it is seen that the effect of going from Standard temperature conditions to Temperate Maximum is to decrease the speed from 343 to 322 mph., and a further increase in temperature to Tropical Maximum cuts the speed to 303 mph. The corresponding losses in amps. are 6½ and 13 percent respectively.

(Continued on page 25)

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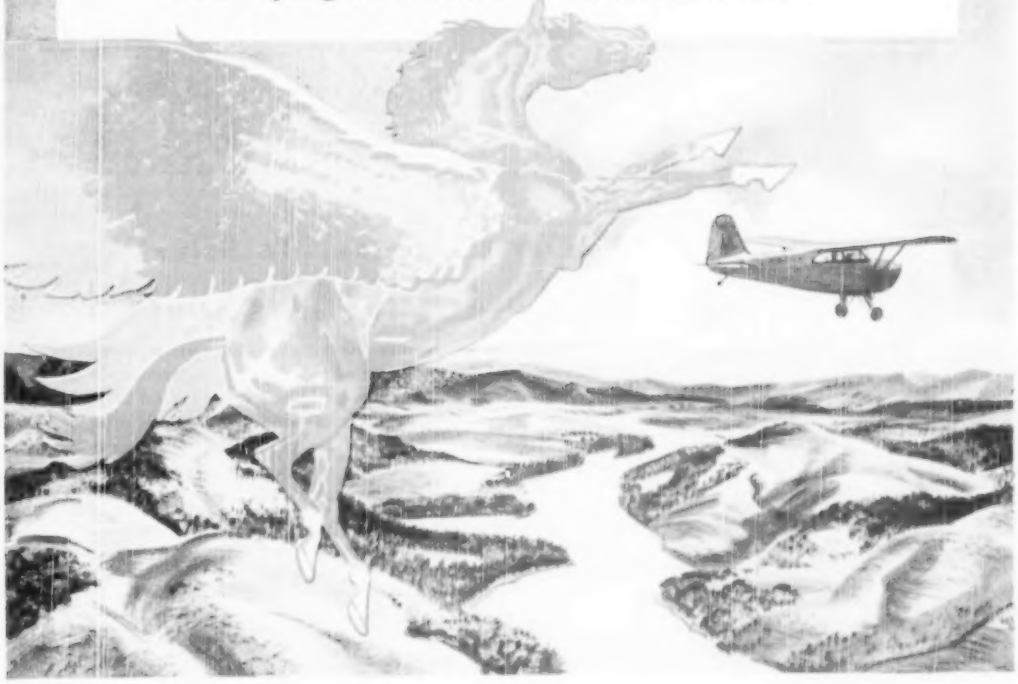

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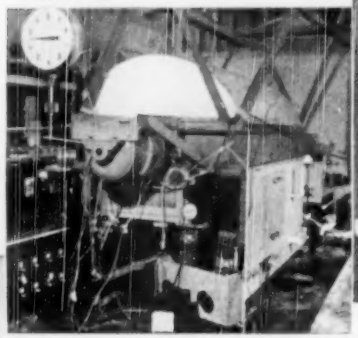

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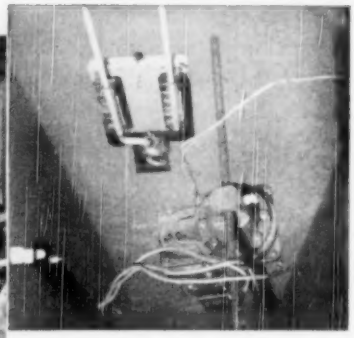

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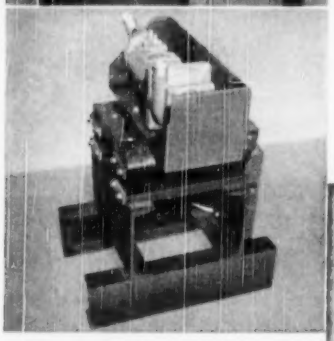

Shaker Table—for testing units ability to withstand severe vibration.

Other Test Equipment not illustrated: Explosion Proof Chamber, Salt Spray Chamber, Ozone Chamber, Signal Generators, 28V—120V D.C., 60-400 cycle AC single phase and 3 phase power sources, and all measuring instruments necessary to show conformance to requirements.

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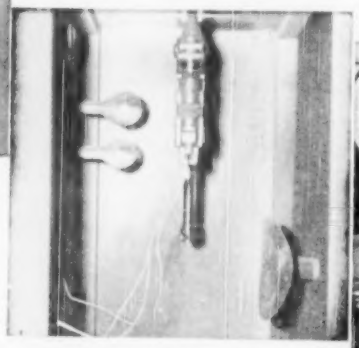

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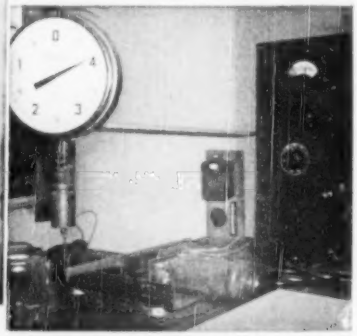

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TABLE II

Variation of Fuel Burnt With Cruise Control Procedure

(MAXIMUM CRUISING RPM THROUGHOUT)

Procedure	Still Air Distance Flown for 40,000 lb. (including climb) nm.	%	Fuel Burnt for 5000 nm. (including climb) lb.	%	Cruising Mean Speed mph.	%
Max. speed	2300	—	42,150	125	423	102
Constant altitude (10,000 ft.)	1150	87	34,250	112	421	102
Constant IAS (251 mph)	1250	90	37,250	109	421	102
Constant incidence	1400	94	36,000	105	418	102
Constant TAS (411 mph)	1527	100	34,250	100	411	100

Even more startling is the drop of nearly 10,000 ft. in operating altitude: this factor is likely to lead to considerable difficulty in flight planning.

These five principles are sufficient for us to form a clear picture of the best general flight plan. Fig. 1 shows typical (a) piston and (b) turbine-engine flight plans for various standard atmospheres (those used here are defined in ECAR leaflet Z8). All the features discussed above are seen—the greater cruising altitudes, the steeper climb, the slowly climbing cruise, the more rapid descent, and, last but not least important, the larger variation of flight plan with ambient air temperature.

▶ **Climbing Cruise Importance**—Of these, the more rapid descent and the slowly climbing cruise are likely to involve the greatest changes in air traffic control when it becomes necessary to mix turbine and piston aircraft. In particular, the slowly climbing cruise will mean that the present method of establishing cruising height by relation to compass heading will be unworkable.

The climbing cruise and the variation of optimum altitude with temperature are the factors likely to have the greatest effect on methods of flight planning and cruise control, particularly when it is realized that temperature changes of 8°C were experienced in as many minutes in the recent flight of the Comet to Central Africa.

▶ **Ampp. Grid**—If we want to go into greater detail, to find out exactly at what altitude we should start to cruise, and how far we should climb during cruise, we must go to special charts for each aircraft. The most convenient chart to use for this purpose is the "Air Mile per Pound Grid" (ampp. grid) first developed by BOAC and English manufacturers in 1945, which has since become a standard method.

Because the rpm are kept constant during the cruise, it is possible to revise the grid now used for piston-engine craft to include the effect of altitude. These charts give the relation between ampp. and forward speed for a range of weights, showing also the altitudes at which these speeds are attained. The look of the resultant chart is new, and it may seem unfamiliar, but these grids are in fact easy to use and a great help in understanding the problems.

Fig. 2 has been specially calculated for this hypothetical aircraft:

Maximum gross weight: 180,000 lb.
Powered by 4 turboprops: 4,500 bhp at takeoff + 1000 lb. jet thrust
Compression ratio: 6:1
Maximum gas temperature: 1100 K
Span: 160 ft.
Parasite drag area: 40 sq. ft.
Airplane efficiency factor: 0.90
Cruising propeller efficiency: 0.85

Some may want to use Fig. 2 to check the accuracy of the statement that high altitudes are necessary for economy, and that the most economical altitudes are those at which the aircraft goes the fastest.

Fig. 2. Air miles per pound grid for hypothetical turboprop craft, showing variation with gross weights, airspeed and pressure altitude for maximum cruise rpm.

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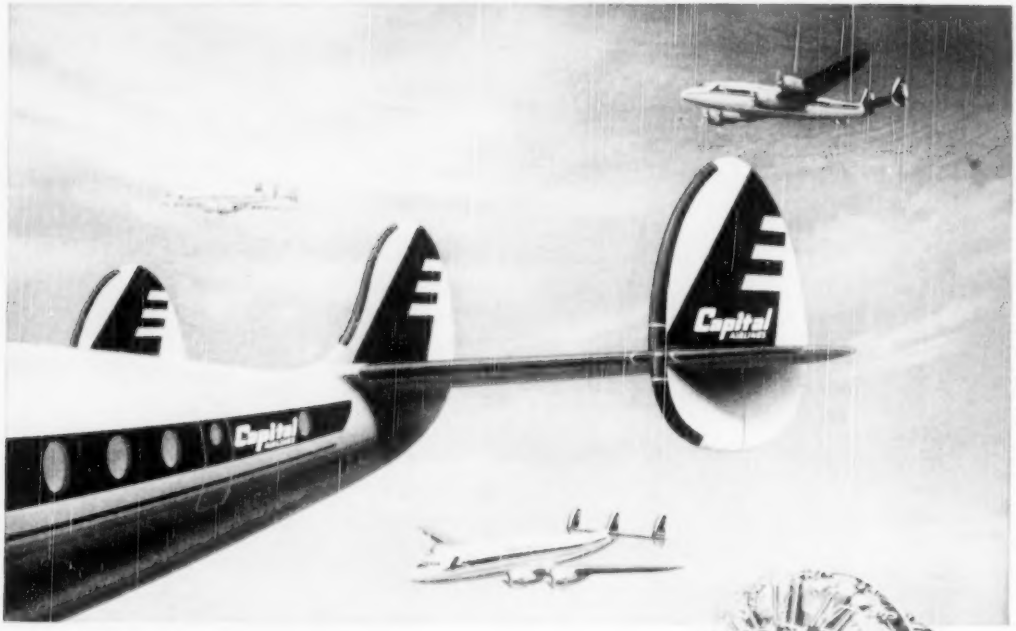

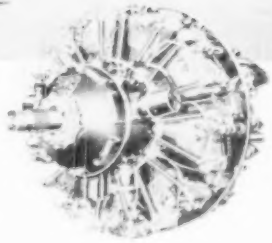

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▶ **Operating Limits**—The most important characteristic of the piston grid, namely the clarity with which the operating limits can be shown, was a prime requirement in developing these charts.

One of the operating limits is obviously that of the maximum altitude permissible with the limiting cabin differential pressure. A second operating limit, not immediately obvious, is the height for maximum speed at each weight. A little thought will show that there is no point in operating at a lower altitude, for not only does the forward speed decrease, but the consumption also increases greatly.

On some aircraft there may also be further limits through critical Mach number or by aeroelastic effects on sweptback wing design. For clarity, these are not shown on Fig. 2.

It will be noticed that no limit of minimum speed is shown on Fig. 2. This last limit cannot be determined with certainty until further experience is available. It is unlikely to be as far to the left as the speed for the maximum amps, because it can be seen from Fig. 2 that the best amps are obtained only 7000 to 3000 ft. below the absolute ceiling and obviously practical difficulties will prevent operation so close to the ceiling.

▶ **Example**—On this type of grid it is simple to work out the effect of different cruising procedures. For instance, if we take off at 180,000 lb. and climb to a height of 30,000 ft. and then maintain this height, we shall move from point A in Fig. 2 and reach point B after burning 40,000 lb. of fuel. The average amps will be 0.0530 and the average forward speed 421 mph. If, however, we have followed the suggestion given above and let the aircraft climb in this case so as to maintain a constant true airspeed, then we shall go from point A to point C. The true airspeed will be 411 mph. throughout, but the average amps will be 0.0956, so that we shall have reduced our cruise consumption by 15 percent at the expense of only 10 mph., or about 2 percent in speed.

It is clear that an infinite number of alternative cruise control procedures can be drawn up from these charts. The problem is to find one that is easy to apply in practice, does not require an extra crew member in flight or render flight planning unnecessarily difficult on the ground, yet comes within measurable distance of the optimum.

▶ **Constant Incidence**—Two possibilities immediately come to mind: First, constant indicated airspeed and second, constant lift coefficient (or constant incidence). Unfortunately, while the former is the simplest, that can be cleared, we shall see from Table III that it is some way from the optimum.

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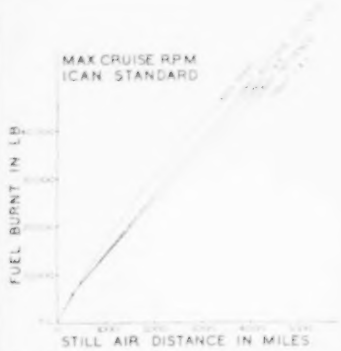

Fig. 3. Variation of fuel burnt with cruising procedure for same hypothetical turboprop aircraft as in Fig. 2.

mum from the point of view of range considerations.

Although a considerable improvement on flight at constant altitude, it is not good enough for long-range work, though it may well be used on short-range turbine aircraft.

The new method now proposed is constant incidence. There is no meter at present available which permits this to be read direct, and it will be necessary, therefore, to work from a series of charts.

First attempts to lay out such tables, however, have shown them to be entirely practicable.

Fig. 3 and Table II have been calculated for the same hypothetical aircraft to show how the weight of fuel varies for a number of cruising procedures. They show that even the maximum speed procedure yields only 3 percent gain over the cruising speed for the most economical procedure considered, in this case constant true airspeed*, though it requires as much as 25 percent more fuel. (Comparatively, a piston aircraft would show a variation of 20 percent in speed for a spread of 20 percent in fuel used.)

Because of the negligible loss in speed through following a relatively economical procedure on a turbine aircraft, and because of the enhanced advantage of decreasing the fuel consumed as compared with a piston aircraft, it means that the maximum speed procedure will almost never be used.

► **Cutting Engines**—All this shows the relative lack of flexibility possessed by turbine aircraft. There is, however, one possible way of increasing flexibility

(Continued on page 32)

* A constant true airspeed procedure is the most economical considered in Fig. 2 and Table II. It is not however, the optimum. Theoretically, a constant incidence procedure, commencing at a greater altitude than shown, would be the best, given the equipment, this would approximate to constant true airspeed.

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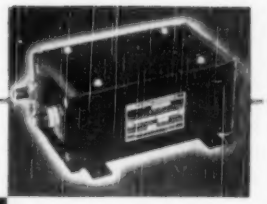
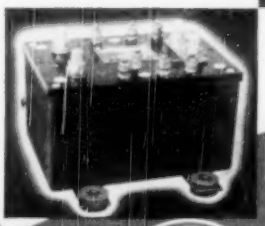
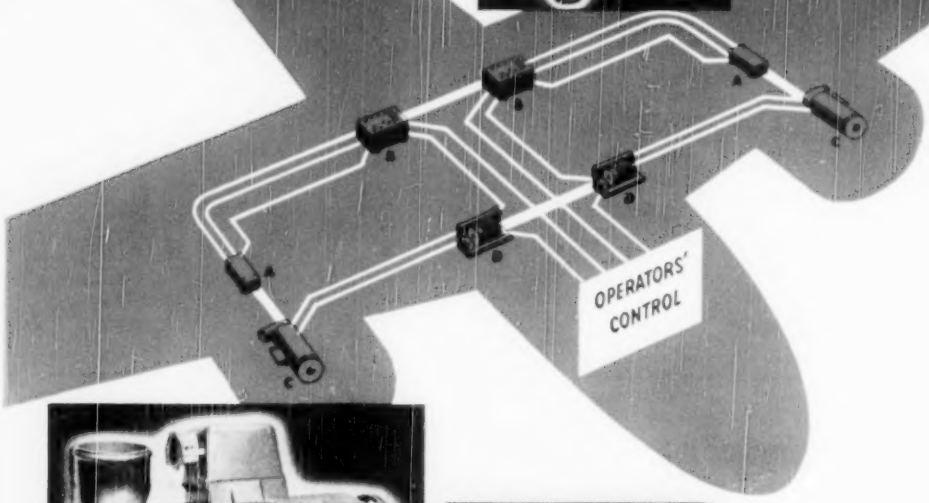
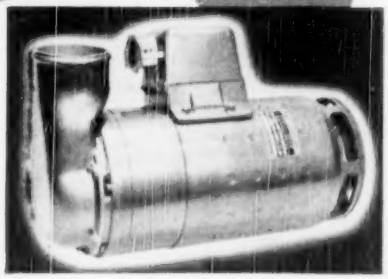


(A) Feeder and Generator Ground Fault Relay

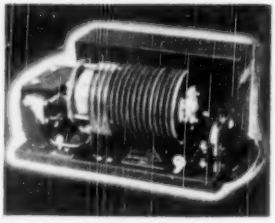


(B) Dual Contactors with Reverse Current Back-up Relay and Feeder Ground Fault Protection





(C) Buttonhole Quick Disconnect Generator



(D) Centralized Plug-in Control Panel

DESIGN FEATURES

1. System functions co-ordinated.
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3. Ground fault protection with current balance or shunts.
4. Concentrated bus.
5. Back-up bus protection.
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7. Arc interruption by dual contactor.
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10. Lightest weight for comparable performance.
11. Generator overtemperature indication. (Optional)
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The D-C system diagrammed here is typical of those operating on aircraft such as the Martin 202, the Lockheed P2V, the North American AJ1, the Northrop C-125, the Aero Sud-Est SE-2010 and the Brequet 765.

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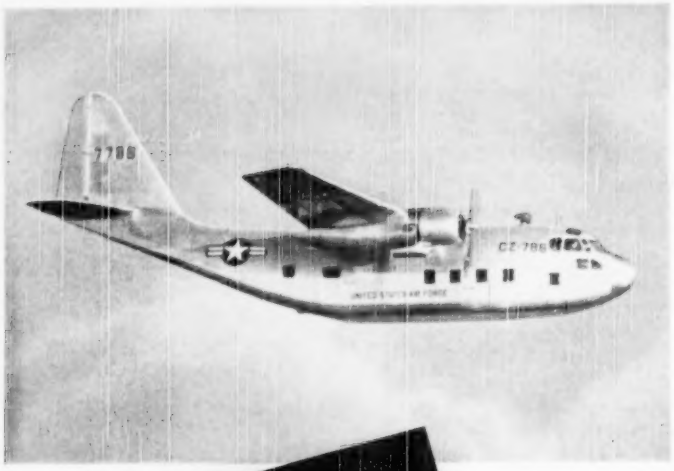

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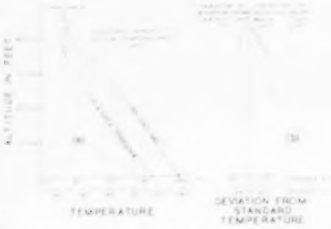

Fig. 4 (a) Typical ambient air temperature readings plotted against various standard atmospheres. (b) Corresponding temperatures plotted in terms of deviation from various standard atmospheres, showing advantages of use of CAA "hot day," if flight altitudes exceed 35,000 ft. without penetrating the stratosphere.

That is shutting down one or more engines in flight, and continuing to operate at maximum rpm. on the other engines.

On a four-engine turbojet aircraft, cutting each engine reduces the cruising altitude by 8000-10,000 ft. Even so, allowing for the cutting of up to two engines on a four-engine aircraft, the maximum spread of speed with all the reasonably economical different procedures appears to be less than 25 percent, compared with approximately 50 percent for a piston aircraft capable of flying at 20,000 ft. Designs with six or more engines may therefore be attractive to an operator faced with problems of delay due to weather and traffic because they should enable close schedule regularity to be maintained.

▶ **Temperature Effect**—So far, we have omitted any reference to the effect of temperature on the best cruise control procedure. This can be demonstrated only by drawing up additional ampe grids for a series of temperature conditions.

But here we must pause for a moment, and consider how we can best arrange our charts to include temperature as a variable.

Obviously, since we intend to climb slowly throughout cruise, the temperature will also be continuously varying, and we shall have trouble trying to keep track of the correct chart if each is drawn up for one particular temperature. Moreover, flight planning will be a nightmare, because even the most elaborate meteorological forecasts will only give us temperatures every 5000 ft. or so, and a great deal of interpolation will be necessary.

The solution to this difficulty is to use the **deviation from the standard temperature** as the variable, and not the temperature itself. This will vary much less than the temperature, as can be seen from Fig. 4(a) in which some unusual actual temperatures measured in flight are plotted against altitude. The

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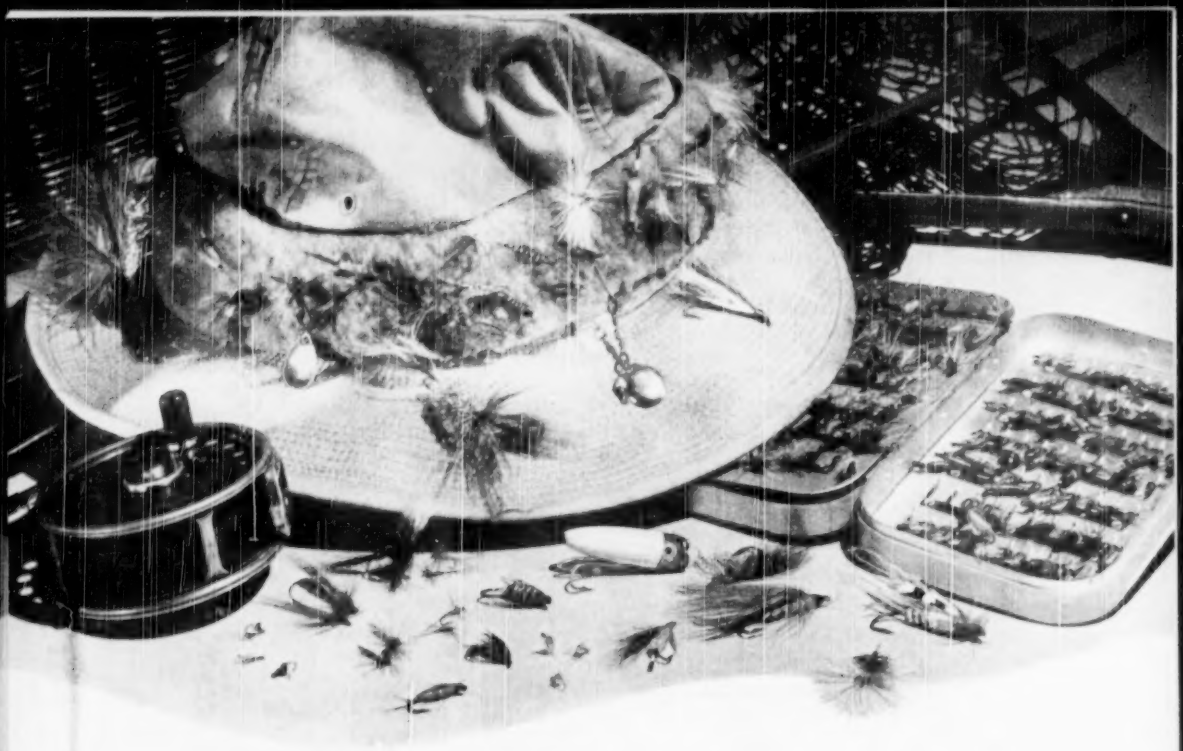

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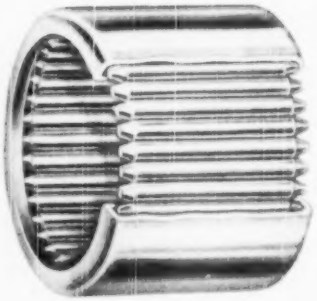

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spread of temperatures is 79 deg. F. (44 deg. C.).

However, Fig. 4(b) will show that temperature deviation has only varied over the range ± 13F. (± 8C.).

This means we should plot all our graphs, and draw up all our tables, for a series of temperature levels: ICAN, ICAN + 2C., ICAN + 8C., etc.

► **Tropopause Varies**—Discussions have already taken place with meteorologists on the possibility of obtaining forecasts directly in this way, and there is no difficulty in this respect. If the particular aircraft is capable of flight at great altitudes, however, there is one point to be observed, because both the British and the American standard atmospheres reach a tropopause at about 35,000 ft., above which the temperature stays constant.

In actual practice, the tropopause varies tremendously in height, not only day to day, but also with latitude, reaching as much as 60,000 ft. in the tropics. When operating through the tropics, at any rate, the actual temperature will continue to fall with increasing altitude above 35,000 ft., so that the temperature deviation from ICAN and NACA standard will show an abrupt change at this height, as disclosed in Fig. 4(b).

For convenience in flight planning and in actual control of the aircraft during flight it is advisable to use the temperature deviation from the "CAA Hot Day." If the same cruise control charts are to be used in temperate latitudes as well, it may even be found desirable to use a new "standard atmosphere" which has the same sea-level temperature and lapse rate as NACA and ICAN, but in which the temperature continues to fall right up to the maximum height at which the aircraft is capable of flying.

In such a short article, it is only possible to deal briefly with the basic problems of operation. It is hoped, however, that sufficient has been said to indicate that obtaining the best out of these new transports will require the use of operational technique of a high order.

A turbine aircraft is essentially a precision instrument capable of a superlative performance over a more limited range of conditions than present piston aircraft. Operation of turboprops or turbojets is therefore not to be undertaken lightly, and the small operator with limited resources must be content for a long time to retain his present equipment. But for the well-equipped and established airline they offer a chance of improving the standard of passenger travel—in safety, speed, comfort and cost—to an extent impossible in any other way.

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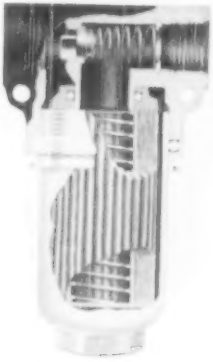

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Bendix AVIATION CORPORATION

Effect of Air Bleed On Engine Operation

"Compressed air isn't free" is a complaint frequently raised in turbine aircraft circles.

The problem of bleeding air from the compressor outlet for miscellaneous services long has plagued designers of engines, aircraft and accessories. Thus, concerned with deterring high engine and aircraft performance from upset bleed practice, while on the other hand it offers a convenient power source for operating various systems.

Considerable quantities of compressed air may be required for operation of current and future turbine-powered planes, for such uses as cabin pressurization and conditioning, protection against ice formation, and boundary layer control.

Sensing this situation, the National Advisory Committee for Aeronautics has conducted a search to determine just how serious the effect of bleed can be.

Its findings are given in a recent Technical Note (2166) "Effect of Compressor-Outlet Air Bleed for Specific Modes of Engine Operation," by technicians F. E. Rom and S. L. Kontz.

Analytical results agreed well with those of experimental investigations.

The agreement tends to substantiate the generality of the methods used in the analytical determination inasmuch as the data were obtained by the matching of components of a different axial-flow turbojet than that used in the experimental determination of the effect of air bleed.

In general, bleeding air from the compressor outlet of an axial-flow turbojet, decreases thrust by slightly more than double the percentage of bleed and increases the specific fuel consumption slightly less than double the percentage of bleed for rated turbine-inlet temperature operation.

Decreasing the turbine-inlet temperature or increasing compressor inlet temperature increases the effect of air bleed on engine performance because of reduction in turbine-inlet temperature ratio.

In all modes investigated, there was no significant difference between variable-area and rated-area tailpipe nozzle operation for all bleeds up to about 0.10 of compressor air flow.

Rotary Actuator

A baby rotary actuator has been added to the large family of actuators produced in recent years by Lear, Inc., 110 Iona Ave., N.W., Grand Rapids.

Designated the Model 167A, the unit weighs less than one pound. It develops a maximum peak output of 110 in-lb, with a normal rated peak load of 60 in-lb. Lear says the device produces a non-linear torque output which approximates typical aircraft duct dampers and fuel valve load curves, "reaching in high 'breakaway' and 'tight closing' torques required for valve operation."

Besides application with fuel, oil and pneumatic valves, its use is indicated with heat control and hydraulic valves, locking controls, and dampers. The company says it can also be used to replace mechanical and solenoid-operated devices, particularly in applications where the load varies with the stroke.

The unit weighs less than one ounce and to complete its full 90-deg. shaft rotation under the normal rated peak load condition of 60 in-lb. Actuator shaft speed can be varied over the operation cycle so that valve closing begins at high speed but shutoff takes place slowly to avoid ram effects in the hydraulic system. The actuator can also be equipped with an adjustable slip clutch which compensates for hydraulic surge loads.

The integral 26v. dc. split-series-wound motor driving the unit is rated for an intermittent duty cycle of one second on and five seconds off. Lear says the device is designed to meet latest government specifications.

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FINANCIAL

Depreciation Rates to Be Changed?

Life of present transport types may be extended, as military needs delay development of new planes.

The impact of changing world conditions on obsolescence, depreciation and taxes may dictate significant changes in airline financial policy concerning flight equipment.

Obsolescence has always been far more important than the actual wearing out of planes in dictating depreciation rates for aircraft in commercial service. Obsolescence may now be postponed almost indefinitely, as far as it may pertain to existing air transport types, as a result of the current accelerated military procurement program.

This circumstance can be constructive to all airlines now flying modern, postwar aircraft. In addition, it will pose some new long-range problems for the industry. More immediately, it may increase airline earnings, at least temporarily.

The replacement of flight equipment in the air transport industry has been keyed to the threat of obsolescence. The use of more modern aircraft benefits the operator, through increased efficiency and lower operating costs. Competitive considerations also make the acquisition of the most modern types of equipment almost mandatory.

▶ **Capital Demands**—Large-scale fleet replacements, in the past, have created heavy demands in new capital requirements to finance the purchase of new airplanes. This factor, if continued unabated at frequent intervals, is bound to undermine the investment stability of the industry.

The airlines were beginning to pass the word around the investment community that jet or turboprop transports for commercial service were not far off. The successful culmination of this development would, of course, have a far-reaching impact on the finances and operations of all air carriers. Once again the race would be resumed to re-equip first and the fastest with the most advanced available transport types.

Nevertheless, competent aeronautical authorities have questioned whether a jet passenger-transport type could be declared ready for commercial service before 1955. This presumed that an actual order were placed to start production. Further, all engineering "bugs" must be eliminated and safety and dependability clearly established. High fuel consumption and associated traffic problems would also have to be considered. Because of these factors, airline observers anticipated even a longer period of time before the jet transport would be ready for operation.

▶ **Brakes Applied**—This was before the Korean war. With military aircraft production being accelerated, the industry may be required to postpone any development of jets for commercial service.

The recent wave of orders by a number of airlines for additional quantities of available transport models, together with planned modification of older types, supports the belief that the threat of revolutionary transports coming very soon is lessening.

While it is true that the Constellation 1049 and the Martin 4104 are both designed to be altered for turboprop installations, it is unlikely that this powerplant will be tested sufficiently to be declared fit for regular commercial service at the time these planes are ready for operation.

The increased tempo of government military aircraft procurement will advance the development processes of jet and turboprop aircraft. The transition to commercial types, however, may be required to mark time until the manufacturing industry will be free to make the necessary adaptations. Even under such circumstances, there is no assurance that this is to be a simple process.

▶ **Stratocruiser Story**—The case history of the Boeing Stratocruiser illustrates this point. Considerable military development went into this plane, which first emerged as the C-97, a cargo and troop transport, when placed in production early in 1947 for the Air Force. The first of the commercial Stratocruisers, which evolved following the military development, made its initial flight test in July, 1947. Following costly and comprehensive test programs, the plane received an approved type certificate from the Civil Aeronautics Administration late in 1948.

It was not until early in 1949 that deliveries of this aircraft started with a few planes turned over to the first contracting airline. To this day, the Stratocruiser is confronted with a number of engineering problems, primarily in its powerplant. It took more than four years after the military type was first purchased, to place the commercial version in service. Even now, after more than a year and a half of operation, "bugs" still remain. The Stratocruiser will ultimately correct its current shortcomings, but it will take more time and expense.

Any entirely new aircraft type, such as envisioned in the jet and turboprop designs, will be required to submit to an even more rigorous and exacting proving period by the CAA before being certificated.

▶ **Value Up**—The reality of these circumstances has increased the value of all existing transports now in operation. For example, most carriers assigned a useable life of four years to DC-4s. In many instances, this equipment has been written down to residual values averaging around $15,000 per plane. Yet, the strong demand for DC-4s today is resulting in firm bids of a minimum of $275,000 to as much as $325,000 per plane for the DC4Bs.

Present depreciation schedules on postwar transports such as the Constellation and DC-6 series are generally computed on a straight-line basis. On this basis, the initial group of these planes is due to run out of depreciation within the next few years.

In all cases, it should become increasingly evident long before present depreciation schedules run their full course, that revisions of charges may be in order. Both depreciation charges represent a heavy tax of earnings.

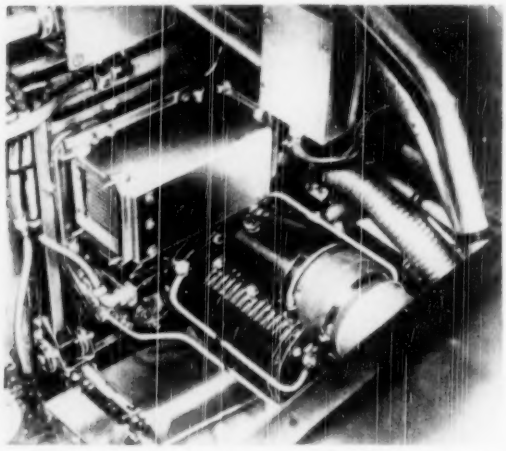
By extending the depreciation basis, airline earnings are bound to increase before taxes. For example, the 16 trunk lines, for the 12 months ended March 31, 1950, reported a net operating income of $24,404,258. However, depreciation on their equipment for the period amounted to $39,556,334.

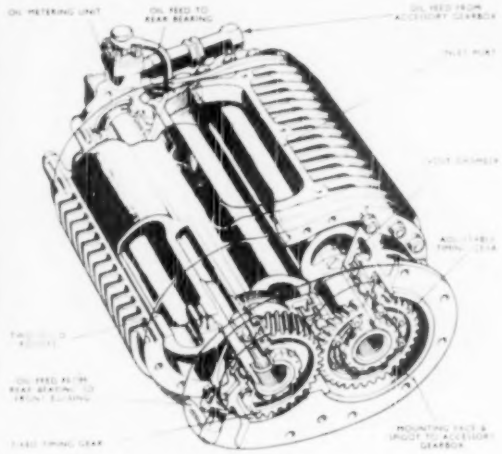
▶ **More for Taxes**—The airlines are also being confronted with a normal tax rate of 45 percent, with the expectation that this high income will remain for some time to come. The early exhaustion of depreciation on—or all merely means more revenue going for taxes.

Any heavy drainage of airline resources will make it difficult to accumulate sufficient funds to help finance subsequent equipment purchases to replace existing fleets.

The higher unit prices likely to prevail for new aircraft types compared with equipment airline from all problems. Early in World War II, material fleet profits were being realized in the sale of DC-3s to the government. Taxes of course, were paid on such gains. When it came time to replace equipment fleets after the war, chiefly with DC-4s, it was discovered that capital requirements per airplane were many times that obtained from the disposed DC-3s.

A repetition of the same pattern may again be in the making.—**Selig Altschul**





Godfrey cabin supercharger shown mounted on a North Star Merlin engine (left). Cutaway of Roots type blower shown in sketch (right).

British U. S., Cabin Blowers Evaluated

TCA installs Godfrey superchargers in its fleet of North Stars; Stratos units go into RCAF's C-5.

Installation of a British-designed cabin supercharger on Trans-Canada Air Lines' fleet of North Star transports, and use of a U. S.-made supercharger on a similar Canadian aircraft, is giving airline engineers a chance to evaluate competitive units under near-similar conditions.

TCA has outfitted its transports with Godfrey Type 15 Mk. 9 units, made by Sid Godfrey & Partners (Canada) Ltd. At about the same time, Canadair installed two Model S6G blowers, made by Stratos Corp., Farmingdale, on a C-5, identical to the North Star type except that it mounts the DC-6 type nacelle and Pratt & Whitney R-2800 engines instead of the Rolls-Royce Merlins in the North Star. The C-5 is the personal plane of Canadian Prime Minister Louis St. Laurent.

Intended for cabin pressurization and air conditioning, Godfrey claims that its equipment is much simpler and more economical to operate than the previous installation. It indicated that TCA's decision to select a cabin supercharger other than the one delivered with the North Star was predicated on fears that the hydraulic drive of the original units would malfunction during the bitter Canadian winters.

Decision to install the Godfrey blower resulted from a visit by TCA engineers to the Godfrey plant in England. They realized that the Godfrey equipment was readily adaptable to the North Star's requirements.

► **Stratos Design**—The Stratos unit is comprised of a conventional centrifugal impeller, the rotational speed of which is automatically variable, independent of engine rpm. Speed is controlled through variation of oil level in a novel hydraulic coupling, similar to an automobile fluid drive, mounted between the engine drive and the impeller. The hydraulic drive for each blower is also manually controllable from the cockpit, permitting one or the other supercharger to be uncoupled or recoupled as often as desired during flight.

Since the output of one supercharger is sufficient for most pressurization requirements, the second unit may be uncoupled and used as a standby. Coupling or uncoupling cycle requires 5 sec. Uncoupled, the Stratos unit draws but four to five hp. from the engine.

Stratos says that the operating blower steals the engine of about 50 hp., approximately the same power required to drive the Godfrey unit, both of which operate continuously during flight.

The Stratos unit, one of which is mounted on each outboard engine, belts directly to the left generator pad on the accessory section and incorporates an emergency disconnect of the blower from the engine in case of failure.

In the case of the C-5 installation, oil used in the hydraulic coupling and to lubricate the supercharger is drawn from the engine oil supply, eliminating the usual supercharger oil tank and cooler. This saves about 140 lb. per airplane.

► **Godfrey Design**—The Godfrey supercharger is a positive displacement blower of the Roots type. Entirely different from the centrifugal configuration, it consists of two twin-lobed, intermeshing rotors revolving within an aluminum housing.

As in the case of the Stratos unit, it mounts directly on the accessory section of the engine. Since the speed ratio available from the Merlin engine was insufficient, a geared-up adapter was required, bringing the supercharger speed up to 5,900 rev/crankshaft.

The speed ratio available to the Stratos unit, 3.0, proved sufficient.

Two Godfrey blowers are provided on each plane, one outboard engine.

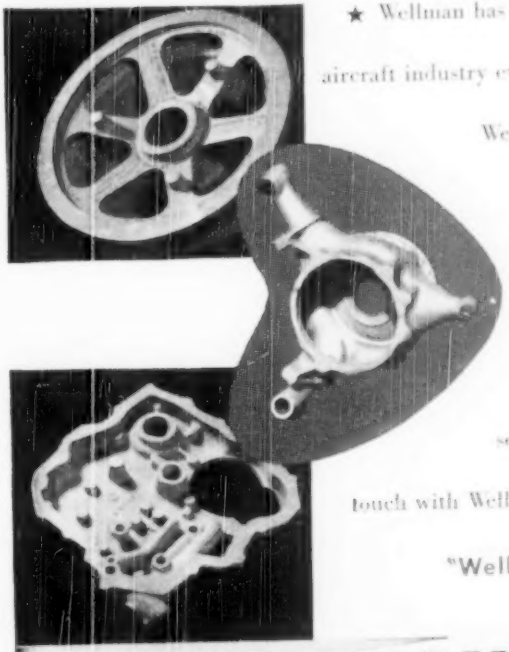
The Godfrey installation also includes a filter in the air intake to protect the equipment from foreign material, and an acoustic silencer in the outlet duct to reduce supercharger noise.

COMPARATIVE PERFORMANCE

• **Air delivery**: Godfrey supercharger, 30 lb. of air at 2400 engine rpm and ambient altitude of 20,000 ft.

Stratos supercharger, 57 lb. of air at

We've Been Up In The Air A Long Time



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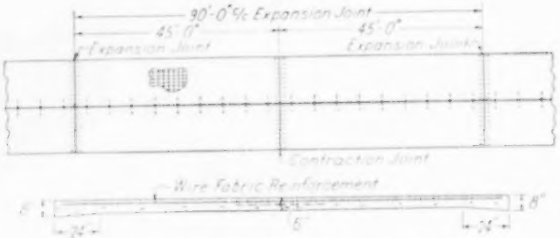

Details of a typical Truscon Welded Wire Fabric reinforced pavement

Structural Action at Cracks in Plain and Reinforced Concrete

As wheel load approaches open crack on plain pavement, loaded slab end carries entire load without assistance from unloaded slab.

As wheel load approaches closed crack in reinforced pavement, aggregate interlock renders the crack joint shear resistant and both slab ends, instead of one, carry the load.

for preventing pavement breaks

Authoritative records kept by 28 states over the past 25 years give reliable proof that maintenance costs are considerably less for reinforced concrete than for *any* other type of pavement. Truscon Welded Wire Fabric gives these advantages to concrete: Resistance to cracking during setting period • Tensile strength against subgrade friction • Resistance to cracking due to warping • Resistance to development and opening of cracks • Resistance to slab separation • Decrease of spalling and disintegration. Write for illustrated literature giving complete details and specifications on Truscon Welded Wire Fabric.

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1800 engine rpm. and ambient altitude of 20,000 ft. (Note: radial engine crankshaft speeds are lower than V type engines, range for range.)

• **Overhaul costs:** Godfrey unit, $0.35 per supercharger hour. Stratos unit, $0.50 on the same basis.

• **Overhaul period:** British blower, 1000 hr. for the first year. A 1600-hr. overhaul period has been approved by the British Air Registration Board. On test runs the Godfrey unit has run well over 2000 hr. without overhaul, according to the manufacturer who expects an 1800-hr. period to be established shortly.

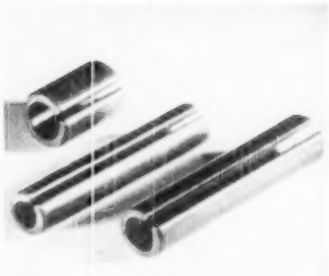
American blower, on the C-5 installation, 1000 hr. of supercharger operation. Since only one operates at a time, this is equivalent to 2000 hr. airplane time. One Stratos operator is establishing a 2000-hr. overhaul period, according to the maker.

▶ **Weight Differences**—Godfrey states that TCA realizes a 250-lb. per plane weight saving over the previous supercharger installation, while Stratos claims that the total installed weight of its two blowers in the C-4 is less than 150 lb.

First TCA installation of the British supercharger was made in 1949, shortly after which the plane was put into regular domestic service for service testing.

More than 2000 hr. of flight testing were accumulated, including hot weather trials in the Caribbean, before the final decision to purchase the unit was reached, according to Godfrey.

Godfrey cabin supercharging and cooling equipment is also fitted to the Avro Jetliner and in England to the Brabazon I, Ariadne Viscount, Hermes and many military aircraft.



Elastic Stop Nut's Rollpin Fastener

Rollpin, unsophisticated looking fastener of a myriad uses, is gaining acceptance in industry, according to the manufacturer, Elastic Stop Nut Corp. of America. Several airframe companies, among them Republic and Fairchild, are using the fasteners in ever increasing applications.

The all purpose, press-fit, self-locking pins serve in the following five general uses: dowels, shafts, cotter keys, pivot or hinge pins and fastening pins.

As a fastener, the device replaces tapered pins, pressed fit pins, keys, etc. to secure pulleys, gears and levers to shafts.

▶ **Advantages**—Advantages claimed by ESNA for the Rollpin are:

• Provides a constant, vibration proof union of parts.

• Ease and speed of installation.

• Ease of removal (a dull pin knocks it out in a jiffy).

• Pins may be reused several times without impairing locking efficiency and without re-drilling holes or substituting a larger size pin.

• Holes may be drilled to normal production tolerances—no extra reaming operations are required.

• Shear strength exceeds that of cold rolled pins of equal diameters.

• Cost (purchase price plus installation) is less than for most other fastening devices.

Although already well established in varied industrial applications, such as diesel engine fuel injection pumps and wind window handles on automobiles, Rollpin's aviation uses are just beginning to be investigated, according to ESNA engineers. If savings are found, an appreciable weight saving may be realized.

▶ **Origin**—The Rollpin was unknown in this country until World War II. Its predecessor was first found in 1712, holding together the bolt-head assembly of a German aircraft cannon.

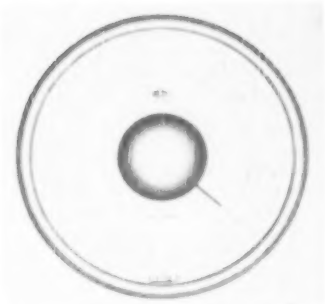
The **spanclinode**, as the Germans called it, consisted of a piece of metal rolled into a cylindrical shape, by design larger than the hole into which it is to be driven. A slot paralleling the long axis of the hollow cylinder permitted compression of the pin as it was driven into the hole. Resulting tension held the pin in position, in spite of heavy loads and severe vibration.

According to ESNA, military specialists in this country were unable to duplicate the bolt assembly without the rolled pin since the device not only held the parts together securely, but also did not extend beyond the hole in which it was inserted and would not move even under the most rigorous tests.

Later, as more rolled pins were found on abandoned captured German equipment, such as gun-sights and aircraft range and direction finding units, specialists replaced the German type pin with a dowel pin, resulting in detrimental effects to the equipment's accuracy. Conversely, when dowel pins in similar United States equipment were replaced with Rollpins, accuracy was increased. This increase in accuracy was attributable to the Rollpin's ability to take up backlash, ESNA claims.

The Elastic Stop Nut Corp. has exclusive rights to the Rollpin. At its Union, N. J. plant, the company is currently manufacturing Rollpins in 17 sizes to fit hole diameters ranging from .0078 (1/8 in.) to .500 (1/2 in.) and has pins available in stock lengths, beginning with 3/8 in. in smaller size pins, although any length may be supplied. ESNA recommends that minimum length of engagement equal 2½ times diameter of hole.

The fasteners are made from SAE 1095 steel and type 420 stainless steel. Pins of beryllium copper may also be obtained, and plated finishes may be specified.



Vernier Barometer

Development of a supersensitive aneroid barometer has been announced by American Paulin System, 1847 Flower St., Los Angeles 15.

The firm says the new instrument is "built around an exclusive system of instrumentation that represents the first new principle in aneroid construction in over 100 years." It is designed for use by airports, airlines, weather stations, and other fields "requiring the finest of precision barometers."

The device, Model FMB-1 Micro Barometer, is designed to record minute changes in air pressure on an overlapping scale graduated to 1/1000 in. hg. It is accurate to one graduation, according to the firm, and gives instantaneous readings without need of corrections for temperature and altitude. Range is from 24.00 to 31 in. hg.

The needle makes over four complete revolutions to cover the entire range, the scale used being determined by the altitude of the station where unit is installed. The instrument can be locked at each end of the scale to prevent damage when turned to altitudes beyond its pressure range.

DEL-type American Paulin barometers are being used with spacecraft and rockets and are standard equipment with many airlines, aircraft manufacturers and other groups in the industry, the firm reports.

NEW AVIATION PRODUCTS

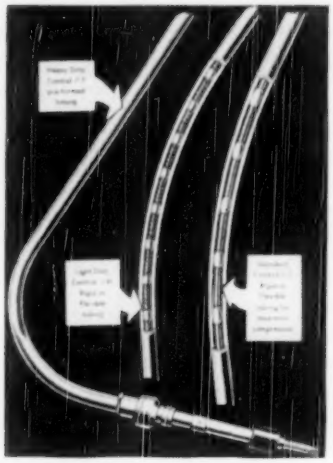
Push-Pull Controls

Improved heavy-duty push-pull controls, performance and professional for aircraft, are being offered by Simmonds Aerocessories, Inc., Tarrytown, N. Y. They were developed expressly to meet stringent requirements listed in the latest military specifications affecting this type of equipment, according to the firm.

The new controls are descendants of those produced by the company during the war. Simmonds engineers have added these improvements:

- **Stronger sliding rods**, made of stainless steel or chrome molybdenum.
- **Redesigned cable guides** to prevent cable jamming and reduce friction. For very high load uses, guides are "double-olive" (dumbbell) shaped instead of "single-olive" (elliptical). This makes them less apt to "rock," slig inner tubing wall and create excessive friction or "jams" when control system is overloaded in compression.
- **Better sealing of controls** at each end to keep moisture and dirt out of tubing but keep grease in.

Simmonds says its latest push-pull controls will be used for operation of a close on the Martin 4-0-4. It also reports they are being used on military craft.



Units have operated satisfactorily in tests over thousands of cycles at temperatures ranging from -72 to 160 F and are designed to operate for about a million cycles without requiring relubrication. For heavy duty work, controls are available in rigid or flexible casings in No. 5 (5/16-in. o.d.) and No. 7 (7/16-in. o.d.) sizes. Light duty units also are available.

ALSO ON THE MARKET

Small relay with AN connector is hermetically sealed and has been given "full engineering approval by the Air Materiel Command," maker says. Sealed enclosure will accommodate 5-amp. relays in contact combinations up to and including four-pole double throw. Address: Advance Electric and Relay Co., 2455 N. Naomi St., Burbank, Calif.

Electric impact hammer not only delivers 10,000 lb. punch, but follows through with "squeeze" of 2000 lb. at end of stroke. Controls can be added to adjust force of blow as desired. Tool will stake, crimp, mark, bend, clinch, cut, rivet or punch. It has 14-in. maximum stroke, working height of 44 in. below spindle, 9½ x 14½ in. base, and weighs 80 lb. Address: Black & Webster, Inc., 50 Pleasant St., Needham, Mass.

Vinyl coating for thermocouple leads and similar parts withstands oils and most chemicals at higher temperatures for longer periods than rubber insulation. Maker says high dielectric strength of product, Geon Plastic 8630, permits thinner walls than are possible with other insulating materials. Company also claims plastic has excellent low temperature characteristics and that it is the only compound of its type available for processing into any desired form. Address: B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15.

Speedy machinist's vise can be quickly opened or closed to any position through push-pull action—eliminating need to spin handle for adjustment. Instant slide action feature does not weaken vise or complicate operation. It has rugged size and strength of conventional models, maker says. A little over one turn of handle counter-clockwise releases jaws, permits it to be shoved by hand to any position. When work is engaged, vise operates in conventional manner. Address: Dodge Mfg. Corp., Mishawaka, Ind.

Safety ladder for hangar and apron work is made of aluminum alloy to combine strength with light weight. Wide steps support 500 lb. each, while ladder itself weighs only 15½ lb. It can be used as a self-supporting or extended to its full 10 ft. height. Legs have rubber coating to protect surfaces in contact with aircraft. Address: Original Products Co., P. O. Box 9135, Ft. Worth.

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2. Be sure to land into the wind and, above all, to maintain your flying speed.

3. If you're heading into the shrubbery and it's apparent that you can't stop, aim the nose of your ship between a couple of trees so that the wings (not the fuselage) will smash some of the shock.

Now, let's assume you've crashed—one of $2,500 each, one million of who knows $10,000 one.

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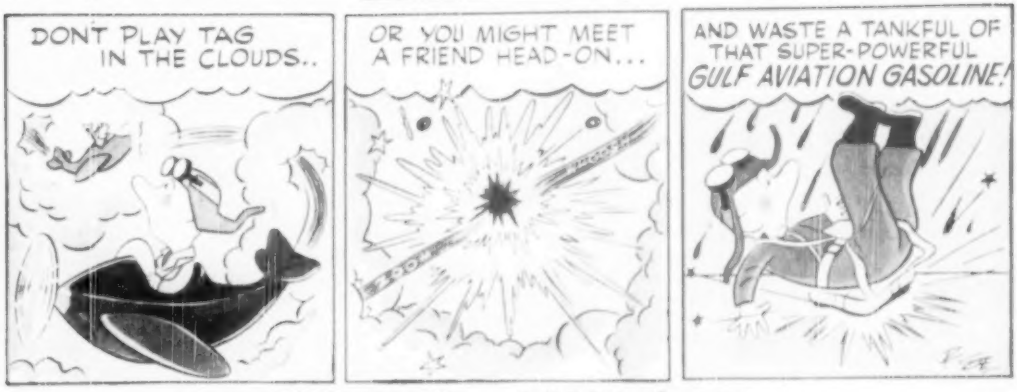

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AIR TRANSPORT

Airline Unions Press Wage Drives

ALPA backs mileage limitation plan; pilots to share benefits produced by flying new, faster aircraft.

By Charles Adams

Airline unions are putting new power in their drives for higher pay and other concessions from the carriers.

Indications are multiplying that the employee groups will not come away from the bargaining tables empty-handed.

▶ **Freeze Feared**—Workers' apprehension that the government may freeze wages during the present international emergency has lit a fire under union leaders.

As a result, some of the negotiations that have dragged on for many months are in a critical stage. Higher living costs and recent pay increases in other industries, notably the voluntary hikes announced by automobile companies, have contributed toward the increased union pressure against airline management.

Reflecting case on higher pilot pay is the 14-month-old dispute between the Air Line Pilots Assn. and American Airlines. Mediation was broken off last month. ALPA wants arbitration, but the company has not agreed to it.

▶ **IAM Campaign**—International Assn. of Machinists is making a strong pitch for higher mechanics' pay from TWA, Northwest, Eastern, National and United Air Lines. First fruits of the campaign came last week, when the union received an adjustment award providing a four-to-six-cent-an-hour wage hike from United, effective to Jan. 1.

Although the award fell far short of IAM's demands, it did check airline management's hold the week-long strike.

Earlier this year, ground employees affiliated with the Transport Workers Union ratified new contracts with five major carriers providing for no pay increases, and the unions were hopeful that the wage quest had been dropped. Now, months of pay boosts, combined with seasons increased costs, not only therefore airline profits but may mean higher fares as well, according to some industry officials.

The PAL-IAM negotiations in an orderly pattern. National Airlines for instance, reportedly has consented to give the same pay boost granted by United.

Northwest and TWA have agreed to arbitrate with IAM. A strike vote has been taken among IAM members employed by Eastern, but a new attempt at settlement was to be made last week. IAM and Capital Airlines also are attempting to work out a new contract through mediation.

▶ **ALPA Demands**—Big issue in American Airlines' marathon negotiations with ALPA continues to be the pilots' demand for a monthly mileage limitation to combat technological unemployment and cockpit demotions resulting from the airlines' use of larger, faster and more productive transports (AVIATION WEEK, May 15). To the contrary, the ALPA bid for more pay for less work constitutes "featherbedding."

ALPA retorts that it is not "featherbedding" when employees ask to share the increasing productivity resulting from technological advancement. "Mileage limitation," according to ALPA President David L. Behncke, "has a terrific national defense aspect since it will mean more trained pilots available for national defense."

Behncke points out that the National Labor Board suggested the possible future need for mileage limitation when it set up the pilots' basic pay structure in 1934. Railroad engineers now have a limit of 4800 miles per month.

▶ **Ability To Pay**—ALPA asserts flatly that American (and presumably other carriers) can afford the mileage limitation.

ALPA says that when applied to Convairs the proposal calls for $17.78 more pay for flying 75 hr. than is now given for the full 85-hr. monthly maximum. A DC-6 captain would get $21.51 more for flying 70 hr. than he has been receiving for the 85-hr. maximum.

(Airline officials expressed belief that pilot demands for other benefits, such as on-duty time limits, might, in practice, restrict a pilot's maximum monthly flight time to considerably less than 70 hr.)

At present, an AA Convair first pilot with eight years' seniority could earn a theoretical maximum of $1020 monthly if he flew the 85-hr. maximum, half day and half night. That's about $12 an hour. The new formula would raise the pilot's pay to about $14.22 an hour, equal to an 18-percent wage hike.

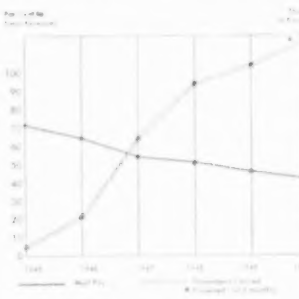
A DC-6 first pilot can now earn a theoretical $1155 monthly under the current contract, assuming eight years' seniority and 85 hr. flying time, half day and half night. That's around $13.82 an hour. The new formula would raise his pay to about $17.20 an hour, an increase of more than 25 percent.

▶ **Union Comparisons**—ALPA contends its demands are far from unreasonable. It says that under the new formula a Convair pilot would get only about 33 percent more pay than was specified for a DC-3 pilot in the original NLB Division 83 wage scale set up in 1934. For DC-6 pilots, the pay would be 55 percent over the scale originally established for DC-3s.

The union points out that from the standpoint of plane miles flown, the Convair is 32 percent more productive than the slower DC-3, and the DC-6 is 41 percent more productive. Passenger-mile productivity has, of course, increased even more.

ALPA argues that AA in 1945 cut the work week of all unorganized employees from 48 to 40 hr. with no decrease in pay. This is roughly proportional to what the pilots are now requesting. In addition, ALPA declares, the unorganized employees were later given substantial pay increases.

"In 1937, the legal minimum wage was 30 cents an hour, with a maximum of 44 hr. work per week," the union continued. "Today the legal minimum is 75 cents an hour, with a maximum of 40 hr. This is an increase of 250 percent in wages and a decrease of more



PIONEER'S PROGRESS

The nation's first certificated feeder, Pioneer Air Lines, started its rising passenger volume and decreased dependence on mail pay when it celebrated its fifth anniversary last month. PAL has carried over 755,000 passengers since August, 1945; its system has grown from 653 route miles serving six cities to 2245 route miles serving 24 cities; employees have risen from 60 to 400, and 11 DC-3s have replaced the initial three Lockheed Electras. A consistent money maker since 1947, Pioneer has twice paid dividends to its stockholders.

than 16.6 percent in working hours. Based on these figures, pilots would receive about $1950 for 71 hr. of flying on DC-3s.

▶ **Formula Explained**—Here's how the proposed mileage limitation formula works for American's postwar equipment:

The base used is 13,600 plane miles monthly on DC-3s (85 hr. of flying time multiplied by 160 mph.—the DC-3's cruising speed). With the Convair's 225 mph. speed, 19,125 plane miles are produced in 85 hr. Difference of 19,125 plane miles for the Convair and 13,600 for the DC-3 gives a 5525 plane-mile productivity increase.

ALPA would divide this productivity increase by two, leaving 2762 miles to be used for the pilots' benefit. The DC-3 base of 13,600 miles would be added, making a total Convair mileage limit of 16,362 miles per month. Dividing the 16,362 by 225 mph. (the Convair speed) gives a maximum monthly flight time of 73 hr.

▶ **DC-6 Limit**—The DC-6, with a cruising speed of 250 mph., now enables the pilot to produce 21,250 plane miles monthly under the 85 hr. limit. Subtracting the DC-3 base mileage of 13,600 leaves a 7650 mile increase in productivity for the DC-6.

Dividing the 7650 by two gives a 3825 mile increase to be used for the pilots' benefit. Add the DC-3 base of 13,600 plane miles, and the DC-6 mileage limit per month under the new formula would be 17,425 miles. At 250 mph., this is equal to 70 hr. of flying monthly.

The same formula works for any plane. Take half the difference between the DC-3 mileage base and any airplane's speed multiplied by 85 hr. and add it to the DC-3 base of 13,600 miles monthly.

▶ **Total Pay Up**—Other contract modifications would keep AA pilots from taking a pay cut despite the reduction in hours. Mileage pay would be increased by boosting the cruising speed of the newer ships under the contract formula.

Thus the pay in effect at present means the Convair's 190 mph. speed, while the new recognized speed would be 225 mph.

There would also be an added increment called "gross weight pay." It would be one mill per mile for each 6000 lb. gross weight of the ship involved.

Thus, at present, a Convair captain's $1030 total pay for an 85 hr. month would include $300 base pay, $594 hourly pay and $136 mileage pay. The $1038 pay received under the new proposal for a 73 hr. month would be divided: base pay $300, hourly pay $475, mileage pay $152 and gross weight pay $111.

Findings Issued In AA Dallas Crash

Faulty execution of an engine-out approach probably caused the crash of an American Airlines DC-6 during an attempted landing at Love Field, Dallas, Tex., last Nov. 24, according to Civil Aeronautics Board investigation.

The Board's official report on the mishap suggested that the crew did not take the added precautions which became necessary when they decided to land with the No. 1 engine inoperative. But contributing importantly to the crash was improper fuel management which resulted in an insufficient amount of fuel remaining in the No. 4 main tank.

▶ **Engine Cut**—Bound from New York to Mexico City, the DC-6 experienced malfunctioning of the No. 1 engine near Nashville. When the engine continued to backfire despite corrective measures it was feathered. The crew decided to continue on to Dallas, believing the engine could be returned to service if needed.

After No. 1 engine was feathered, no attempt was made to transfer fuel from No. 1 main tank, resulting in about 1400 lb. more weight being on the left side of the plane than on the right when it arrived at Dallas.

Weather at Love Field was clear with only a 5 mph. wind. But the turn to final approach placed the DC-6 to the left of the runway and an "S" turn was made to correct the misalignment. During this turn the plane skidded to its left, the air speed dropped abruptly and the ship settled rapidly.

▶ **Ship Stalled**—At this point the captain increased power to Nos. 2, 3 and 4 engines in an attempt to maintain control. The ship continued across the airport on a heading about 40 degrees to the left of the landing runway in a tail-low attitude. An engine continued to fall the flaps, difficult to use because of the fuselage, and a stall developed just prior to striking a fence and other buildings on the northeast side of the airport.

In the fire following the crash, 78 of the plane's 80 occupants were killed. Survivors included the captain, first officer and flight engineer.

▶ **Wrong Procedure**—CAB said that in attempt has failed to match the aircraft did not comply with the prescribed operating procedures for an engine-out approach with DC-6 aircraft. The Dougl. Ops operating manual specified that in remaining for a landing with one engine inoperative the pilot shall not use more than 30 degrees wing flap until he is positive he will complete the landing.

Douglas said this was necessary in order to maintain a suitable three engine rate of climb. In this case, the flaps were extended fully during execution of the "S" turn.

Turning to the faulty fuel management, CAB said it was impossible to compute exactly how much gas remained in No. 4 main tank when the DC-6 made its approach at Dallas. But on final approach the flight engineer said he saw a warning light flicker and the fuel flow meter of No. 4 engine reading zero.

▶ **Fuel Pressure**—Zero-booster pump was used and full reserve applied to engines Nos. 2, 3 and 4. The captain said No. 4 engine came in with a "ter-rific" surge of power. Immediately the left wing dropped and the plane started to turn to the left. Just before the crash the No. 4 propeller was feathered when it was noted that fuel pressure to No. 4 engine was zero.

The flight engineer and his gauge indicated there were about 50 gal. of fuel in the No. 4 main tank. However, tests with No. 1 engine off were made with another DC-6 with about 40 gal. of fuel in the No. 4 main tank—the amount CAB believed was in the wrecked craft by computation.

It was found that a severe right skid caused No. 4 engine to cut out momentarily, and with the return of power there was overcontrolling of the engine, causing a left wing low and yawing condition. The relatively small amount of fuel in No. 4 main tank moved centrifugally to the right during the right skid, thereby uncovering the outlet of the tank, which is at the left side of the tank. When the engine responded with a surge and the plane yawed to the left, the tendency of the left wing to drop was aggravated by the 1400 lb. of fuel differential in the left tank.

TWA Orders Ten More Martin 4-0-4s

A TWA order for ten additional Martin 4-0-4 transports has brought new commercial transport purchases during the past several weeks to more than $47 million.

The Martin transports to be delivered next year are in addition to 30 4-0-4s which TWA contracted for in March. Earlier last month, TWA placed a $6 million order for six more L-749A Constellations, and Eastern Air Lines bought four additional 92-passenger L-1049 Super Constellations for $6 million (AVIATION WEEK Aug. 21).

▶ **75 on Order**—Latest TWA purchase of 40 (twenty 4-0-4s) brings total sales of Martin's new pressurized twin engine airliner to 75. Both TWA and EAL had options to purchase more of the planes when the original orders were announced six months ago. Price per

plane at that time was about $740,000.

Meanwhile, TWA has begun scheduled flights with leased Martin 2-0-2A transports. Eight of these planes have been delivered to the carrier, and the remaining four will be available shortly.

CAB Continues Ban on Sisto

The Civil Aeronautics Board has again denied restoration of a commercial pilot certificate to Carlos R. Sisto, former American Airlines pilot captain whose DC-4 plane crashed full of an outside loop near Mt. Riley, N. M., Oct. 8, 1947 (AVIATION WEEK Mar. 8, 1948).

CAB, in issuing its decision, stipulated that Sisto could not hereafter be issued any pilot certificate or rating which would enable him to carry passengers for hire. CAB in its original investigation, determined that Sisto had engaged the gust lock mechanism of the DC-4, which caused the violent maneuver endangering the lives of 49 passengers and five crew members on a scheduled flight Oct. 8, 1947.

SHORTLINES

▶ **Aer Lingus (Irish Air Lines)**—Recently increased its all DC-3 fleet to 14 by purchase of an additional plane. Company's annual report showed sharp rise in all-cargo revenue, up $140,000 over the previous year. Cargo growth has hatched the operation of all-freight services to London and Manchester, and indications are for further development especially in winter months when passenger traffic declines.

▶ **BOAC**—This month increased its nonstop New York-London service from two to four per week. The extra direct flights will displace four New York-Shannon-London services, so total New York-London trips will remain at nine weekly.

▶ **Civil Aeronautics Administration**—Subcommittee of the industry-government Airport Use Committee will study air traffic problems in the Washington, D. C., area Sept. 12-14 to determine if improvements can be made to reduce congestion and incidental conflicts. Similar surveys have been conducted recently at Minneapolis-St. Paul, Chicago, St. Louis, Jacksonville, Newark, Houston, Miami, Los Angeles and San Francisco.

▶ **El Al Israel National Airlines**—Recently celebrated its first birthday and announced plans to put Constellations on its scheduled routes shortly. The carrier also said it would open new routes from Lydda to Teheran via Athens and Istanbul, and Lydda to the Union of South Africa via Khartoum.

▶ **Mid-Continent**—Reports $33,931 net profit in July, compared with $45,638 net profit in the same month last year. Higher passenger and cargo traffic boosted operating revenues $62,111 over July, 1949, but operating expenses jumped $70,992. Net profit for the first seven months of 1950 was $187,874, against $192,035 in the comparable 1949 period.

▶ **Northwest**—Has got Stratocruiser equipment on its Seattle-Anchorage, Alaska, run, cutting flying time nearly two hours.

▶ **Pan American**—Is at more than two hours off its New York-Caracas, Venezuela, travel time when it recently replaced DC-4s with Constellations on five of its seven weekly flights.

▶ **Post Office Dept.**—Plans to advertise for bid a new air mail route to be operated between Mackinac City, Mich., and Mackinac Island, Mich., during the closed season of water navigation.

▶ **TWA**—Reported record traffic at Los Angeles on Monday, Aug. 21, when it handled 662 passengers and would have handled more if equipment had been available. Company's program for converting passenger DC-4s into cargo liners has been delayed by transfer of equipment to the Pacific airlift, but four DC-4s, now on international runs will undergo modification to freighters at Kansas City starting Sept. 15.

▶ **Turner**—The Indianapolis-based feeder line has asked CAB for an exemption to operate between Indianapolis and Cleveland via Richmond, Ind.; Dayton, Springfield, Columbus, Mansfield and Mansfield, O., and between Cincinnati and Chicago via Richmond and Kokomo, Ind. Company alleged that TWA and Delta Air Lines do not want to continue service to several communities along these routes. Turner also asked temporary authority to serve Gary, Ind.

▶ **United**—Recent traffic survey showed that cut flowers top UAL's list of air freight commodities from a volume standpoint. Next ranking commodities, in order of volume, are machines and machine parts, wearing apparel, electrical equipment, automotive parts and accessories, dry goods, radios and radio parts, aircraft parts, chicks and poults and printed matter.

COPTER STAMP

Belgium commemorates Sabena's inauguration of daily helicopter air mail pickup and delivery service with Bell 47 D1s by picturing one of the rotary-wing craft on a new air mail stamp.

CAB SCHEDULE

Sept. 11—Prehearing conference on Modern Air Transport's application for individual exemption as an irregular air carrier (Docket 3947).

Sept. 11—Prehearing conference on renewal of Wisconsin Central Airlines' feeder certificate (Docket 4261 et al).

Sept. 11—Hearing on Lehman Brothers' interlocking relationship case, involving partners in firm holding airline director-ships (Docket 3055 et al).

Sept. 11—Hearing on enforcement proceeding involving interlocking relationships of Aerovias Airways, Inc., and California Airways (Docket 4257).

Sept. 11—Resumption of hearing in CAB's enforcement proceeding against Trans American Airways (Docket 4181).

Sept. 11—Hearing on CAB's investigation of Pan American Airways' proposed space charter fare (Docket 4581).

Sept. 11—Oral argument on service to Salzburg (Docket 3248 et al).

Sept. 12—Prehearing conference on TWA's request to suspend restriction on service on Albuquerque and Santa Fe (Docket 4216).

Sept. 14—Oral argument on CAB's enforcement proceeding against Mohawk Air Transport (Docket 4160).

Sept. 18—Hearing on TWA and American Overseas Airlines requests to suspend service at 19 additional no-frills-Atlantic routes (Docket 4228 et al).

Sept. 18—Oral argument in Mohawk-Wisconsin merger case (Docket 2832-34 et al).

Sept. 19—Prehearing conference on service to Mexico City, Texas (Docket 4301).

Sept. 20—Prehearing conference on TWA-Transcontinental interchange agreement (Docket 4245).

Sept. 21—Prehearing conference on Mohawk Airlines' request to serve Lincoln, Neb. (Docket 4310).

Sept. 25—Hearing on Havana-New York case (Docket 4225 et al).

Sept. 26—Prehearing conference on operations for service to Kansas (Dockets 4158, 4177, 4179, 4192 and 4200).

Sept. 27—Prehearing conference on Alaska-Hawaii-Pacific Northwest-Chicago case (Docket 4188).

Oct. 2—Hearing on renewal of Keystone Airlines' feeder certificate (Docket 4248 et al).

Oct. 4—Hearing on CAB's investigation of Eastern Air Lines' proposed Miami-San Juan-Santo Domingo (Docket 4301).

Oct. 9—Hearing on Delta Airways' air freight case (Docket 4404 et al).

Oct. 16—Oral argument on new application of Bar Harbor Airways for mail certificate and for additional authority to serve passengers (Docket 4361).

Dec. 11—Hearing on CAB's investigation of West Coast passenger fare structure (Docket 4261).

Jan. 8, 1950—Hearing in Big Four mail rate case (Docket 2448 et al).

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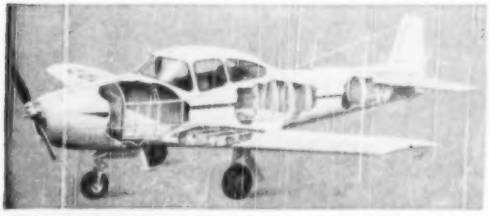
"Never before has there been a plane of such quality . . . such outstanding performance in *every* way . . . a plane so thoroughly reliable and serviceable. To combine all that in full measure is a master accomplishment."



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LETTERS

Missiles Oversold?

Your editorial July 31 on our national shortcomings re the guided missile program . . . was so significant that I passed it on to my publisher, Mr. Frank L. Taylor, who is also a director of the Hearst Corp. Mr. Taylor, in turn, is so struck with the "right-news" of the editorial that he wants to send it to Mr. William Randolph Hearst as a suggestion toward moving editorial opinion along similar lines.

My suggestion in passing the matter to my publisher was that newspapers such as this might well adopt a more questioning attitude toward the bilderdash handed out by the armed services to AP and other news services, instead of printing the reports . . . as glorious accomplishments.

FRED HARTSER, Business Editor
Milwaukee Sentinel
Milwaukee, Wis.

Far be it from me to disagree with your astute observation that the missile program is full of confusion and old line prejudices, but it's only fair to those who are honestly pursuing the scientific development of the missile that their problems be acknowledged.

In the missile you have a vehicle that must go twice as fast as any airplane yet developed and do it without any human intelligence for on-the-spot control. In attaining this high speed it has to traverse the transonic range with all of its inherent instability problems . . .

And the accelerations! Twenty Gs during the takeoff boost phase and 15 Gs for design maneuvering are not uncommon. This all has to be done with a missile already having a wing loading of 400 or more pounds per square foot. Shall we not pity the structural designer?

It is an unfortunate circumstance that we are developing a new airframe and powerplant at the same time, for one tends to hold back the other, but this cannot be helped. The same holds true for the electronic gear but to a lesser extent. Electronic controls and homing devices can be made to work but are uncomfortable in their complexity for installation in the small space presently allotted them in a missile.

Looking at the production phase shows that lack of high-temperature-resistant materials and fabrication methods for the new missiles can hold back the current development. For the airframe, a new criterion in manufacturing tolerances has evolved. No longer is a sheet metal structure acceptable. The missile body and wings must now be machined to tolerances measured in thousandths of an inch with leadership wing leading and trailing edges. Rejections run high and will until new manufacturing processes are developed.

None of these problems is insurmountable, but their solution will require time and money. However, this is no excuse for the present waste and duplication of effort.

EARL R. HINZ
5703 Waverly Ave.
La Jolla, Cal.

Congratulations on your editorial, "Overselling the Missile." Talking brass tacks about what has been publicized as accomplished versus what is needed is at least a step in the right direction.

However, aren't you missing the real point by expecting too much for the $100 million? The Peenemunde establishment was reported to have cost 300 million Reichsmarks, which, allowing for slave labor, probably far exceeded what has been spent here so far, and ended up with apparently only a paper design for a trans-Atlantic rocket.

Published reports of practical "down-to-earth" calculations made in 1946 indicated then that to carry a one-ton payload over a 6000-mile range would require a two-stage rocket weighing initially around 2500 tons. This is a large order. Undoubtedly, there have been advances made since 1946. Then again, maybe another three billions are needed to develop THE rocket to carry THE bomb.

Can we afford to spend what it costs?

ALFRED ALFRIANO
25 Forest Ave.
Caldwell, N. J.

(*Mr. Alfriano is one of the pioneers in U. S. rocketry and is currently employed at Curtiss-Wright Propeller, in rocket work. Of course, he cannot have forgotten that the V-2 was also a product of the Peenemunde establishment. Or that Peenemunde also did tremendous amounts of research on other types of missiles, including Wasserfall (German white hope among anti-aircraft missiles) and Enzian (Messerschmitt's white elephant among AA missiles). The money also bought something like 1500 test rounds and their attendant calculations and much collection of data. However, the editorial was most concerned with a carefully thought out and directed guided missile program—which we do not have now—and the importance of not misleading the American people into believing that we do have it.—ED.*)

While your editorial is right in pointing out the need to eliminate waste of money, time and effort in missile development, there appear to be several flaws in your reasoning which should be corrected.

For one thing, there should be a sharp differentiation between duplication of administrative effort and duplication of research effort. The first is, as you say, wasteful. The success of research depends, however, on the clarity and ingenuity of the thinking of the research scientists. It is very easily conceivable that among two groups working independently toward the same end, one will find the way to develop the desired product, while the other will not. It would be unfortunate if in eliminating duplication of effort the work of the group destined to succeed were dropped.

And who is to know which group will succeed until the research is carried to a finish completed? As an example, both we and the Germans were trying to make an atomic bomb during the last war. We succeeded; they did not.

Then, concerning the V-2 rocket, that rocket was built by the Germans under wartime pressure, at tremendous expense. It is capable of performance in speed and alti-

tude that is not less impressive for having been continually repeated for five years. There have been improvements made in the guidance and control systems. Is there any reason to go to astronomical expense figures to design and build bigger and better "V-2s" when the existing ones, used in conjunction with smaller missiles, can help us obtain from the smaller ones all the data necessary to design the large missiles desired?

Finally, concerning the "tests," it will be recalled that some years ago scientists predicted that it would be in the order of 20 years before missiles could be practical on scale application. If the public is now disappointed because missiles are not yet practical, perhaps it is because magazines and newspapers have kept before their eyes only the goal, without pointing out clearly enough the obstacles to be overcome before reaching the goal.

In a field that is so "dynamically changing as rockets and missiles," it would be silly to go overboard to build in large quantities a missile that "looks" good only to find that a new development a month later makes that missile obsolete. It is certainly better to run hundreds of tests on hundreds of different missiles, each teaching something new and each better than the last, knowing that these tests will lead to something that is really good, rather than to rely upon something which will let us down at a time when we have devoted ourselves into trusting it in a tight spot.

I think that while AVIATION WEEK should continue to point out the inefficiencies in our guided missile program, it should also examine progress made in the light of the problems to be solved. It will thus keep the public informed better than they can be from the rash and questionable promises for missiles by publicity-minded spokesmen and military officers of these programs.

SEYMOUR J. DEITCHMAN
363 B Allenhurst Road
Buffalo 23, N. Y.

Safe Air Shows

I am prompted to write this in respect of The Cleveland Air Races and the dangers inherent in this type of show, in view of the Royal Air Force Display which took place recently.

Here was a show which held the attention of 200,000 people from morning to evening, and which could presumably be organized by the USAF as an annual event. Each and every aspect of the work of the RAF was dealt with by hundreds of exhibits and displays on the field itself.

All I do say is that there is a definite issue in this type of show and if the "conservative" authorities in this country can do what they did at Farnborough recently, then I see no reason why similar actions cannot be taken in the U. S. Possibly an "East Coast" and a "West Coast" event would have to be staged to ensure reasonable coverage.

PERCY E. COOKLEY
47 Fellands Hill North
London, S.W. 16, England

WHAT'S NEW

New Publications

A new **air express directory** is being prepared by Railway Express Agency. It lists in alphabetical order, by states, all the REA offices—they provide air express service to over 23,000 localities. A complimentary mailing list is being set up. Write the company at 230 Park Ave., New York 17.

A **subject index to technical documents** issued in Vol. 12 of the Bibliography of Technical Reports for the period July-Dec., 1949, is now available. Price of the index is one dollar. Write the Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D. C.

Flight Safety Foundation's revised publication plans provide for annual subscription to the **Accident Prevention Bulletin** at $25. The APB covers both broad and specific safety problems, including pilot proficiency, design hazards and search and rescue. Subscription also includes **Accident Investigation Bulletins** issued bimonthly and normally costing $7.50 yearly. FSF's address is 515 Madison Ave., New York.

A **year book** describing the Wing Club's activities and listing its membership for 1949-50 has been issued to the organization's 1016 members. The 78-page volume is profusely illustrated.

Flight Lines is a new bimonthly aviation magazine put out by the Aeronautical Division of Minneapolis-Honeywell Regulator Co. Articles of general interest and company product information are featured. Editor is Merrill Jones. Write the company at 2753 Fourth Ave. South, Minneapolis 8.

New Quarters

Douglas Aircraft Co., Inc., has moved its New York offices to 230 Park Ave., New York 17. Phone number is MUrray Hill 9-6110.

Aviation Distributors & Manufacturers Assn., is now located at 1900 Arch St., Philadelphia 3. Phone number is LOcust 4-3454.

Alexander Milburn, Inc., oxy-acetylene and welding apparatus makers, have transferred their headquarters to 1201-45 Raleigh St., Baltimore 30.

United Air Lines has opened a new ticket and reservations office at Rockefeller Center, 7 W. 49 St., New York. Phone number is MUrray Hill 2-7300.

Coral Designs division of the Henry G. Dietz Co., electronic, electrical and mechanical controls maker has moved to new and larger quarters at 12-16 Astoria Blvd., Long Island City 2, N. Y. Phone is RAvenswood 6-3547.

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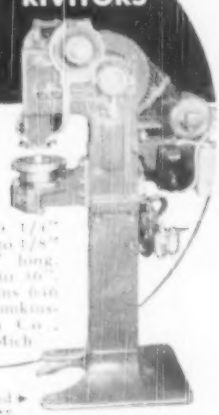

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THERMODYNAMICIST—GRADUATE engineer to perform theoretical and design analyses of gas turbine jet engine plants. Must be analytical with practical application of manufacturing problems. Background in thermodynamics, fluid dynamics, and heat transfer necessary. Five years experience in applied engineering in these subjects. Must be capable of writing good reports. Please [illegible] reply to Solar Aircraft Company, 1200 Pacific Highway, San Diego 12, California.

DEVELOPMENT OR Experimental Engineer—Graduate engineer with five years experience in applied engineering, preferably in development. Familiar with current engineering Mechanical design ability with background in thermodynamics and combustion. Capable of supervising development tests and writing good reports. Please [illegible] reply to Solar Aircraft Company, 1200 Pacific Highway, San Diego 12, California.

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AIRLINE TRANSPORT Pilot—Non Flying Captain—desires appointment as pilot for private individual or corporation. Bachelor, no weight-lift and 1 engine minimum. Flight engineer license or all-grounded without fault. Large numbers [illegible] time, [illegible] salary $[illegible] monthly. Available immediately. Travel anywhere. BW-[illegible], Aviation Week.

EARNS GRADUATE [illegible] in demand in aeronautical engineering, aviation and airport management. Also [illegible] engineering. Write early for next graduation. Parks College, Dept. A, East St. Louis, Illinois.

POSITION WANTED—Young man 27, married with 2 children, now connected as product sales manager, farm equipment and auto parts manufacturing concern. Desires change, aviation industry preferred, preferable location in mid west. Owns home, commodious house and electric [illegible] equip. Has extensive knowledge automotive and of Business. Executive [illegible] sales organization. Unencumbered [illegible] seek free lance writing, photography, landing, logging, [illegible] and employee relations. (W-[illegible]), Aviation Week.

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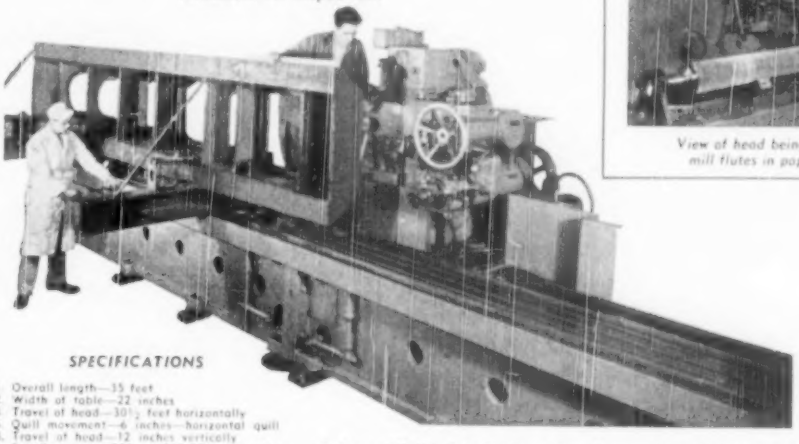

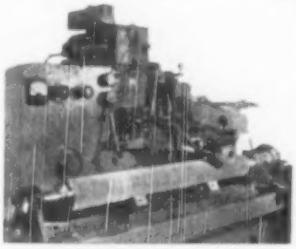

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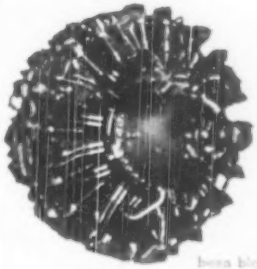

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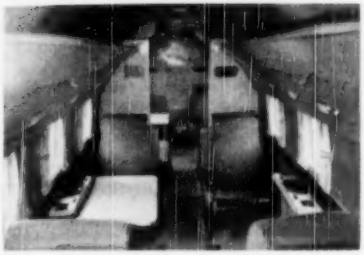

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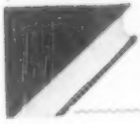

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EDITORIAL

Nonskeds Must Clean House

Whether the nonskeds realize it or not, new danger signals are flying. It's the public—not the CAB—that must be watched.

Most of you readers know that we have always been a friend of the nonscheduled air carriers. From their beginnings, we have contended that their lower fares tapped a new market in passenger transportation, and that the major scheduled lines could learn from some of their traffic economies and lack of frills. We urged the CAB to permit at least some of them to operate, if they operated safely.

Although there have been several accidents on the transcontinental runs of the nonskeds, the number has been much less than the established industry expected. The coast-to-coast nonskeds have a much better safety record than those flying elsewhere.

For months the nonskeds reaped insignificant criticism from their flying public. Recently, however, the tide has turned. Some of the carriers and agencies erred gravely in their public relations and services. Whether the percentage of agencies and carriers thus guilty is large or small is not as important as is the fact that enough have been guilty to shake public confidence. In this case, the public is beginning to worry more about being mulcted than about being injured. This is inexcusable.

Advertising has been misleading, if not inaccurate. The public is being guaranteed service it is not always getting. And "slip-ups" are not accidental as often as the carriers and the agencies would have the public believe. There is misrepresentation as to frequency of service, destinations, and types of equipment. Higher rates are charged in advance for "four-engined aircraft" flights that turn out to be flown with two-engined aircraft. Fares range all over the scale. People are kept waiting hours, sometimes days.

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Probably the most misleading practice yet of all has been to confuse the passenger about the type of insurance coverage in effect. One or two carriers at least have been handing their passengers slips such as the one reproduced above. The implication is that the passenger is covered by trip insurance. Actually, in this case, it is the carrier who is insured by the insurance company. To collect, a passenger or his heirs might well be compelled to sue the carrier, or threaten suit. In some states where limitations are in effect, it would be impossible for an injured passenger or his heir to collect anything approaching $50,000. There might also be a judgment that the carrier was not guilty of negligence, which would further complicate the problem.

We certainly don't think all of the nonskeds are guilty of sharp business practices. But if **any of them** continue to mishandle the public in such manner they run the gravest danger of losing the very public confidence and support that has made it so difficult for CAB to dare put them out of business.

When the nonskeds lose the public support, they will find that the next serious accident may well drag them all down to oblivion. These are kind words, constructive words, but deadly words of warning.

The Railroads' Toll

The next time you hear about the railroads' safety record you might keep in mind that the heralded figures are the number of train passengers KILLED while riding on trains.

You do not hear that in the years 1938 to 1948, inclusive, there were 50,501 Americans killed by the nation's railroads. In the same period 583,123 were injured.

These figures include passengers, trespassers, travelers not on trains, employees on duty. These categories include grade crossing accidents.

But they are all Americans, killed and injured, thousands of them, as a result of trains.

Now, you tell us. Suppose aviation started killing 5300 persons each year (roughly the 1949 total for the railroads) and injuring 32,000—whether they were passengers or victims in houses under falling planes or airline employees at airports.

Would we American people take the matter as calmly as we do the railroads' yearly toll? Why do we fail to consider that this rail toll is news? Why aren't the newspaper headlines shouting these figures from the front pages? Fifty deaths in an airliner is top news. Three thousand deaths a year from trains is a figure buried in the Interstate Commerce Commission statistical reports.

Without attempting in any way to deprive the railroads of credit for their fine passenger fatality rate, let's remember there is much more to the railroads' overall safety record than meets the casual eye.

Robert H. Wood

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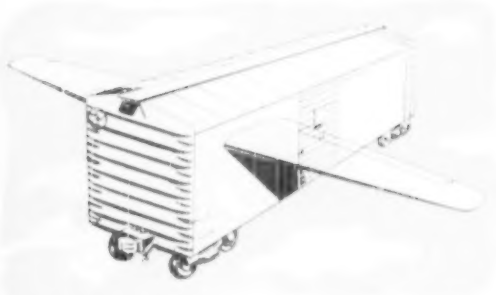

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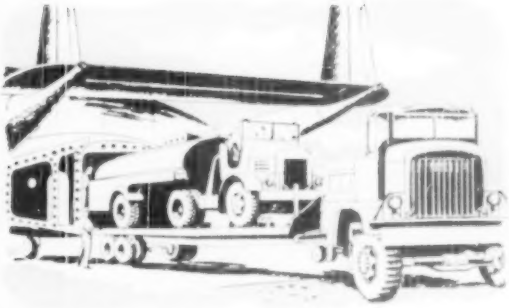

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The CH9 was developed by General Electric as a component part for the Pratt & Whitney Aircraft R-4360-C engine. This new powerplant has been subjected to grueling tests under difficult conditions.

In addition to increased power for cruising, this development makes possible more takeoff power and lower fuel consumption.

Shorter takeoffs, more speed and much heavier payloads are the resulting advantages of this new powerplant.

Vastly simpler than any other compound engine now on the market, the new powerplant eliminates troublesome geared superchargers, clutches, gearings and fluid disks that waste energy and add expense. There are no mechanical connections between the engine and the turbo.

In the present configuration, the CH9 is fitted to the R-4360-C. It can be adapted to any piston engine of similar size. For further information, call your nearest G-E sales representative or write Apparatus Dept., General Electric Co., Schenectady 5, New York.

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